**Acerca de este libro**

Esta es una copia digital de un libro que, durante generaciones, se ha conservado en las estanterías de una biblioteca, hasta que Google ha decidido escanearlo como parte de un proyecto que pretende que sea posible descubrir en línea libros de todo el mundo.

Ha sobrevivido tantos años como para que los derechos de autor hayan expirado y el libro pase a ser de dominio público. El que un libro sea de dominio público significa que nunca ha estado protegido por derechos de autor, o bien que el período legal de estos derechos ya ha expirado. Es posible que una misma obra sea de dominio público en unos países y, sin embargo, no lo sea en otros. Los libros de dominio público son nuestras puertas hacia el pasado, suponen un patrimonio histórico, cultural y de conocimientos que, a menudo, resulta difícil de descubrir.

Todas las anotaciones, marcas y otras señales en los márgenes que estén presentes en el volumen original aparecerán también en este archivo como testimonio del largo viaje que el libro ha recorrido desde el editor hasta la biblioteca y, finalmente, hasta usted.

**Normas de uso**

Google se enorgullece de poder colaborar con distintas bibliotecas para digitalizar los materiales de dominio público a fin de hacerlos accesibles a todo el mundo. Los libros de dominio público son patrimonio de todos, nosotros somos sus humildes guardianes. No obstante, se trata de un trabajo caro. Por este motivo, y para poder ofrecer este recurso, hemos tomado medidas para evitar que se produzca un abuso por parte de terceros con fines comerciales, y hemos incluido restricciones técnicas sobre las solicitudes automatizadas.

Asimismo, le pedimos que:

+ *Haga un uso exclusivamente no comercial de estos archivos* Hemos diseñado la Búsqueda de libros de Google para el uso de particulares; como tal, le pedimos que utilice estos archivos con fines personales, y no comerciales.

+ *No envíe solicitudes automatizadas* Por favor, no envíe solicitudes automatizadas de ningún tipo al sistema de Google. Si está llevando a cabo una investigación sobre traducción automática, reconocimiento óptico de caracteres u otros campos para los que resulte útil disfrutar de acceso a una gran cantidad de texto, por favor, envíenos un mensaje. Fomentamos el uso de materiales de dominio público con estos propósitos y seguro que podremos ayudarle.

+ *Conserve la atribución* La filigrana de Google que verá en todos los archivos es fundamental para informar a los usuarios sobre este proyecto y ayudarles a encontrar materiales adicionales en la Búsqueda de libros de Google. Por favor, no la elimine.

+ *Manténgase siempre dentro de la legalidad* Sea cual sea el uso que haga de estos materiales, recuerde que es responsable de asegurarse de que todo lo que hace es legal. No dé por sentado que, por el hecho de que una obra se considere de dominio público para los usuarios de los Estados Unidos, lo será también para los usuarios de otros países. La legislación sobre derechos de autor varía de un país a otro, y no podemos facilitar información sobre si está permitido un uso específico de algún libro. Por favor, no suponga que la aparición de un libro en nuestro programa significa que se puede utilizar de igual manera en todo el mundo. La responsabilidad ante la infracción de los derechos de autor puede ser muy grave.

**Acerca de la Búsqueda de libros de Google**

El objetivo de Google consiste en organizar información procedente de todo el mundo y hacerla accesible y útil de forma universal. El programa de Búsqueda de libros de Google ayuda a los lectores a descubrir los libros de todo el mundo a la vez que ayuda a autores y editores a llegar a nuevas audiencias. Podrá realizar búsquedas en el texto completo de este libro en la web, en la página `http://books.google.com`

This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

**Usage guidelines**

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

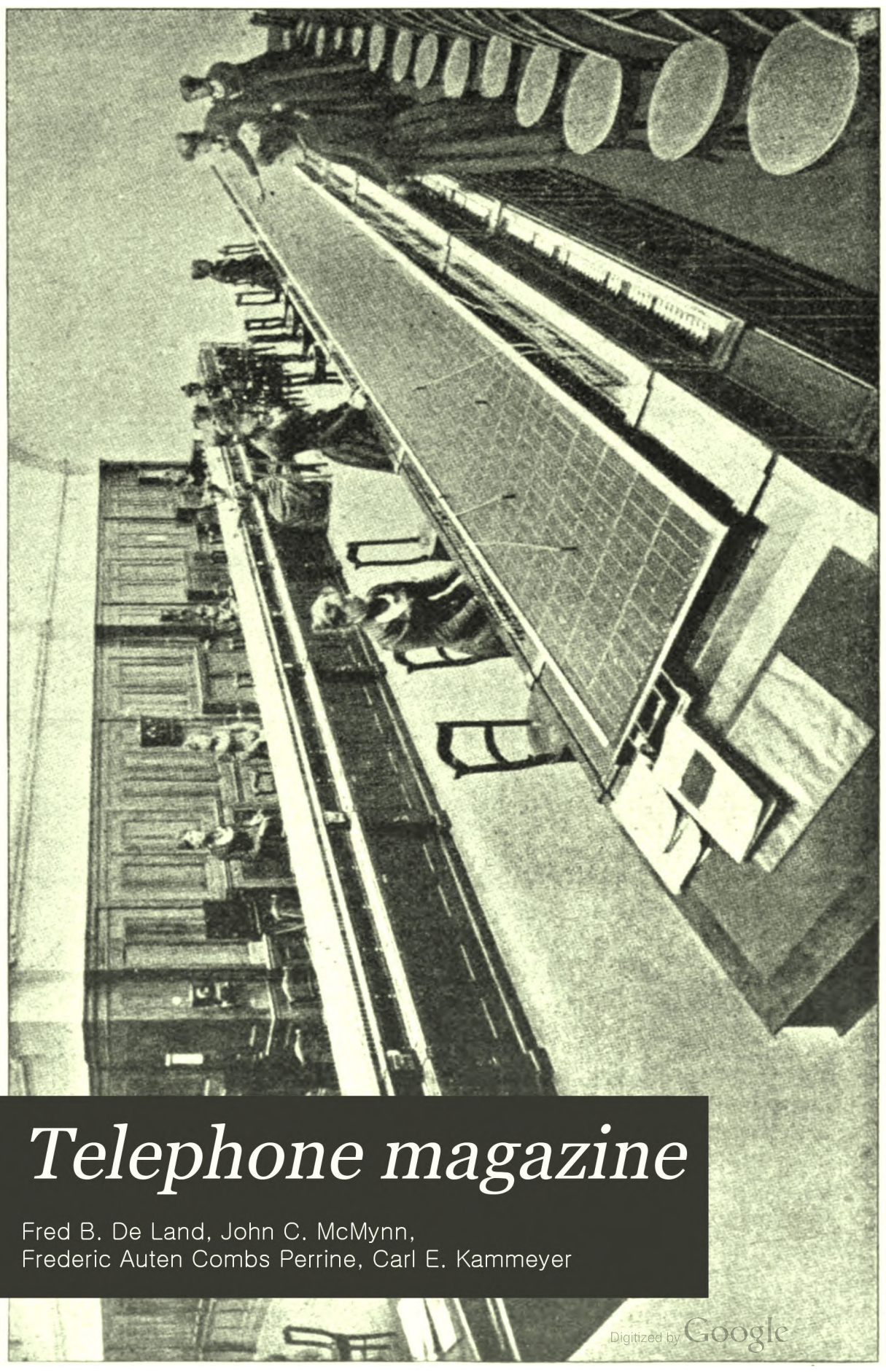
+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

**About Google Book Search**

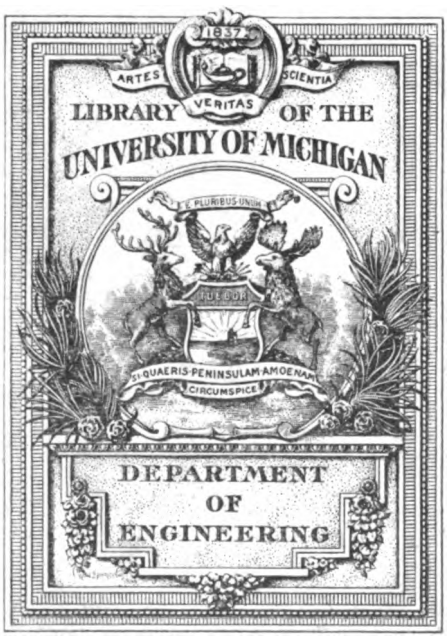
Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`



# *Telephone magazine*

Fred B. De Land, John C. McMynn,
Frederic Auten Combs Perrine, Carl E. Kammeyer

Digitized by Google




Digitized by Google

LIBRARY
TK
1
.T29

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

# Telephone Magazine

AN ILLUSTRATED MONTHLY MAGAZINE

---

VOLUME XVI

JULY TO DECEMBER, 1900

---

EDITED BY

W. J. BUCKLEY AND A. J. KUSEL

---

PUBLISHED BY

ELECTRICAL ENGINEERING PUBLISHING CO.

MARQUETTE BUILDING, CHICAGO

Digitized by Google

PRESS OF
THE HENRY O. SHEPARD COMPANY
212-214 MONROE STREET
CHICAGO

Digitized by Google

# CONTENTS OF VOLUME XVI.


PAGE

Acid Test for Paint ..... 195
Advance in Switchboard Construction ..... 170
Aluminum Conductors, Protecting ..... 179
Amalgamation of Pacific Coast Companies ..... 145
American Battery Compound ..... 106
American Electric Fuse Company's Eastern Office ..... 105
American Enterprise at Paris ..... 23, 24
American — Newly Designed Telephone ..... 199
American — Some New Exchanges ..... 24, 71
American Street Railway Association ..... 105
Arrangement and Equipment of New Exchanges. By the Inspector ..... 12
Automatic Slot Telephone, A New ..... 15

Batteries for Exchange Use. A. S. Dinsmore ..... 6
Belgian Test of Wireless Telegraphy ..... 235
Bell Company, What Kansas City Wants from the ..... 192
Bell, List of Companies Controlled by the ..... 181
Bell Telephone Offer ..... 200
Bell, To Replace ..... 15, 55
Berlin, The New Office in ..... 45
Brighton (England) Municipal Conduits ..... 239

Case, A Peculiar ..... 240
Central Battery System, The Latest ..... 61
"Central," Some New Telephone Devices ..... 16
"Century," The New Transmitter ..... 23
Chicago Telephone Supply Company ..... 68
Copper Saving in the Joint Transmission of Direct and Alternating Currents. Dr. Frederick Bedell ..... 1
Cumberland Purchases ..... 239

Decision, English, An ..... 170
Desk 'Phone, A New ..... 195
Desk Set, A New ..... 234
Development of the Telephone. Edward S. Barber ..... 107
Development of the Telephone in the United States ..... 234
Directory, Telephone, New ..... 192
Dry Versus Wet Batteries. P. P. Nungesser ..... 182
Duplex Telephony ..... 209

Editorial ..... 22, 66, 104, 144, 180, 219
Eureka Apparatus, Some New ..... 69
Eureka, Progress of ..... 160
Exchanges, Some New ..... 103, 138
Extensions Near Home ..... 195



195939

Digitized by Google

PAGE

Flirting Expensively ..... 145
Flux, A Perfect Soldering ..... 71
Free Telephones ..... 144
Franchises, Decision Affecting Telephone ..... 200
Franchises, Russian ..... 235

Holtzer-Cabot Bi-polar Receiver, The ..... 102

Independent Items ..... 27, 111, 157
Insulation By Ice ..... 183
International Association of Municipal Electricians ..... 104
Iowa Company Absorbed, The ..... 236

Japan to Adopt American Telephones ..... 229

Kellogg Catalogues, The ..... 105
Kellogg Switchboard Supply Company ..... 22

Literary Notes ..... 70
Lodge System of Signaling ..... 194
Long Distance Equipment in Hotels ..... 203
Long Distance Telephone in Norway ..... 196

Marconi Test, A ..... 236
Measured Service Device, The Stroud ..... 238
Metallic Cement, A ..... 198
Municipal Ownership, A Plan for ..... 230

Nebraska Items ..... 23
News Telephone ..... 168

Paris Exposition, First Prize Medal at the ..... 235
Paris Exposition, The. H. Morgan ..... 152
Patents, Monthly Digest of Telephone and Kindred. By Edward E. Clement ..... 29, 74, 113, 146, 185
Penny in the Slot ..... 150
Philippines, 'Phones for ..... 170
'Phone Displaces Telegraph ..... 240
Poles, To Preserve Wooden ..... 234
Profitable Field for Extension in Small Exchanges, A ..... 11
Protective Devices, Some New ..... 87

Rates at Columbus, Ohio, Cutting ..... 239
Rates, London, England ..... 218
Rates, Some Telephone ..... 150
Recent Publications ..... 25, 109, 151
Removal Notice ..... 123
Rubber, Artificial ..... 234
Russian System Sold ..... 196

South African Trade ..... 194
Specifications, Pole Line ..... 72
State Association, A ..... 145
Statistics, Comparative French Telephone ..... 218
Steamer Telephones ..... 159
Sterling Imperialism ..... 159

Digitized by Google

PAGE
Studied Sweetness ..... 101
Sued for Competition ..... 66
Switchboards, Telephone. H. P. Clausen ..... 57, 89, 125, 161, 205

Talks and Cross-talks. By the Inspector ..... 17, 96, 134, 171, 223
Telephone, A Recording ..... 237
Telephone, First Practical Use of the ..... 239
Telephone Manufacturing Company, A New ..... 5
Telephone News ..... 201, 241
Telephone Principle Adapted to Rapid Telegraphy ..... 193
Telephone Receiver Applied to Wireless Telegraphy, The ..... 227
Telephone, The Mego ..... 181
Telephone Train Dispatching. A. J. Kusel ..... 169
Telephone Trust, A ..... 22
Telephones and Telegraphs at the Paris Exposition. E. J. Gavey ..... 210
Telephones, Another Railroad to Adopt ..... 234
Telephones in Berlin Fire Service ..... 183
Telephoning on Telegraph Lines ..... 240
Telephoning Over a Ray of Light ..... 184
Telephonograph, A ..... 209
Terre Haute Exchange, The ..... 139
Trade Notes ..... 43, 87, 123, 236
Train Telephones ..... 193
Transmitter, A New ..... 196

Underground ..... 170

Want Ads ..... 44, 88, 124, 160, 204, 248
Western Business ..... 145
Western's New Business ..... 196
Western Toll-line Board, The ..... 65
Wire for Telephone Purposes, Manufacturing of ..... 8
Wireless Telegraphy ..... 138
Wireless Telephony in Practical Use ..... 233
Wireless Telephony. Sir William Henry Preece, K.C.B ..... 143

Yukon, Delayed Construction in ..... 193

Digitized by Google

Digitized by Google

# Telephone Magazine

Copyright, 1900, by Electrical Engineering Pub. Co. Entered at the Chicago Postoffice as mail matter of the Second Class.

VOL. XVI. CHICAGO, JULY, 1900. NO. 106

## COPPER SAVING IN THE JOINT TRANSMISSION OF DIRECT AND ALTERNATING CURRENTS.*

BY DR. FREDERICK BEDELL.

If a source of direct electromotive force of 50 volts be connected in series with an alternating electromotive force of 50 volts, the total electromotive force as measured by a voltmeter will be found to be approximately 70 volts. This may be very easily tried. What is true of electromotive forces is likewise true of combined direct and alternating currents, and this too may be shown by experiment, but not so easily. It may be shown on the draughting board by plotting the alternating current, displacing its axis by an amount equal to the direct current, and ascertaining the virtual value of the resultant by means of a planimeter from a curve plotted to show the squares of the resultant current. Plotted with polar coördinates the process is simpler. The result is always the same.

If different values be given to the direct and alternating current, the resultant will always be greater than either, but less than the algebraic sum; in fact, the resultant will be found to be the hypothenuse of a triangle, whose two sides are respectively equal to the direct and alternating currents, virtual values being used in all cases.

That this is generally true may be proved as follows:

Let $A \sin x$ be the alternating current, with maximum value $A$ and virtual value

$$\overline{A} = A \div \sqrt{2}.$$

Let $B$ be the value of the direct current.

The resultant instantaneous value of the two combined is

$$y = A \sin x + B.$$

The mean square value of $y$ is

$$\frac{1}{2\pi}\int_0^{2\pi} y^2\,dx \text{ ; or}$$

$$\frac{1}{2\pi}\int_0^{2\pi} B^2\,dx + \frac{1}{2\pi}\int_0^{2\pi} 2AB\sin x\,dx + \frac{1}{2\pi}\int_0^{2\pi} A^2\sin^2 x\,dx.$$

Integrated between the limits 0 and $2\pi$, the first term becomes $B^2$ and the second term vanishes. The third term * becomes

$$\frac{A^2}{2}, \text{ or } \overline{A}^2.$$

The mean square value of the resultant $y$ is accordingly $\overline{A}^2 + B^2$. The virtual value is equal to the square root of the mean square value, or $\sqrt{\overline{A}^2 + B^2}$.

Hence: If an alternating and a direct current be superposed, the virtual value of the resultant is the square root of the sum of the squares of the direct and alternating currents.

This result may be shown to be true, irrespective of the wave form of the alternating current.

From the foregoing, it follows that the joint transmission of direct and alternating currents results in a saving in weight of copper and in copper losses, and it will be shown in the tables

*Read at the New York Meeting of the American Association for the Advancement of Science, June 26-30, 1900.

$$*\sin^2 x = \frac{1}{2} - \frac{\cos 2x}{2}.$$

$$\text{Hence} \int_0^{2\pi} \sin^2 x\,dx = \left[\frac{x}{2} - \frac{\sin 2x}{4}\right]_0^{2\pi} = \pi.$$

Digitized by Google

which follow that *either saving may be as much as fifty per cent.*

It is not my purpose here to consider the question of systems of distribution for the joint transmission of direct and alternating currents, except in the one aspect of copper saving. It may be said that no engineering obstacles arise to detract from the practicability and desirability of such a system. The requirement is a system of line distribution whereby independent *A. C.* and *D. C.* generators may supply current to independent *A. C.* and *D. C.* apparatus, the alternating and direct currents being independent in their generation and utilization, and combined in their transmission.

In the following discussion, let us designate the two currents as $I$ and $i$, these being called the first current and second current respectively. When each current is transmitted by an independent conductor, we will designate by $R$ and $r$ the resistances of the conductors for the currents $I$ and $i$, respectively. For the first current the line losses are $RI^2$ and the drop $RI$; for the second, the losses are $ri^2$ and the drop $ri$. In the separate systems, the currents $I$ and $i$ are supposed to be transmitted at the same current density. When the two currents are transmitted jointly over the same conductor, let $I'$ be the virtual value of the resultant current, and $R'$ the resistance of the common conductor. For convenience, the first current $I$ is the larger and is taken as a unity. The resistance $R$ is likewise taken as the unit of resistance. A single length of conductor is taken as the basis of discussion.

TABLE I.

Relative heating effects of like and unlike currents.

| $I$, First current. | $i$, Second current. | $I+i$, Sum. | $I'$, Resultant, unlike currents. | Heating effect, like currents. | Heating effect, unlike currents. |
|---|---|---|---|---|---|
| 1 | .1 | 1.1 | 1.005 | 1.21 | 1.01 |
| 1 | .2 | 1.2 | 1.020 | 1.44 | 1.04 |
| 1 | .3 | 1.3 | 1.044 | 1.69 | 1.09 |
| 1 | .4 | 1.4 | 1.077 | 1.96 | 1.16 |
| 1 | .5 | 1.5 | 1.118 | 2.25 | 1.25 |
| 1 | .6 | 1.6 | 1.166 | 2.56 | 1.36 |
| 1 | .7 | 1.7 | 1.221 | 2.89 | 1.49 |
| 1 | .8 | 1.8 | 1.281 | 3.24 | 1.64 |
| 1 | .9 | 1.9 | 1.345 | 3.61 | 1.81 |
| 1 | 1.0 | 2.0 | 1.414 | 4.00 | 2.00 |

Table I shows the relative heating effects of like and unlike currents. Table II shows the saving in the joint transmission of direct and alternating currents on the basis of the same current density in their joint transmission as in their independent transmission. Table III shows the saving in the copper, when total losses are the same for joint as for independent transmission. Table IV shows saving in losses for the same amount of copper. Table V is on the basis of discarding entirely the copper of one of two systems, and retaining only the copper of the remaining system to carry both currents. I am indebted to Mr. William Ambler for assistance in computing and checking the tables.

*Discussion of Table I.*—The fourth column in this table gives the virtual value of the resultant current $I'$ obtained from the joint transmission of the currents $I$ and $i$, either one of these being alternating and the other direct. It will be seen that the resultant current is always considerably less than

TABLE II.

Showing the saving in distributing direct and alternating currents jointly instead of separately, on the basis of constant current density.

| $I$, First current. | $i$, Second current | Saving in total copper, %. | Saving in total line losses, %. | Saving in drop for $I$, %. | Saving in drop for $i$, %. |
|---|---|---|---|---|---|
| 1 | .1 | 8 64 | 8.64 | .50 | 90.05 |
| 1 | .2 | 15.00 | 15 00 | 1.96 | 80 40 |
| 1 | .3 | 19.69 | 19.69 | 4.21 | 71.27 |
| 1 | .4 | 23.07 | 23.07 | 7 15 | 62 86 |
| 1 | .5 | 25.47 | 25 47 | 10.55 | 55.27 |
| 1 | .6 | 27.12 | 27 12 | 14.24 | 48.54 |
| 1 | .7 | 28.18 | 28.18 | 18.10 | 42.67 |
| 1 | .8 | 28.83 | 28.83 | 21.94 | 37.55 |
| 1 | .9 | 29.21 | 29.21 | 25.65 | 33.09 |
| 1 | 1.0 | 29.30 | 29.30 | 29.30 | 29.30 |

Digitized by Google

the algebraic sum of the two component currents, and that in fact it is only slightly larger than the value of the first current, (Column 1).

This saving in the resultant current assumes importance from the fact that the line losses vary as the square of the current. If the two currents $I$ and $i$ were like currents, i. e., both being direct currents, or both alternating currents of the same phase and frequency) the losses would depend upon the *square of their sum.* When one current is alternating and the other direct, the losses depend upon the *sum of their squares.* For like currents, $I$ and $i$ flowing thru a resistance $R$, the losses are

$$RI^2 + 2RiI + Ri^2.$$

For unlike currents, the losses are only

$$RI^2 + Ri^2.$$

These are tabulated in the last two columns of Table I, from a comparison of which the saving in using unlike currents is obvious. For example, let

TABLE III.

Showing saving in copper and change in line drop for joint transmission with the same total losses as in separate transmission.

| $I$, First current. | $i$, Second current. | Saving in total copper, %. | Increase in drop for $I$, %. | Saving in drop, for $i$, %. |
|---|---|---|---|---|
| 1 | .1 | 16.5 | 9.0 | 89.1 |
| 1 | .2 | 27.8 | 15.4 | 76.9 |
| 1 | .3 | 35.4 | 19.2 | 64.2 |
| 1 | .4 | 40.9 | 20.7 | 51.7 |
| 1 | .5 | 44.3 | 20.0 | 40.0 |
| 1 | .6 | 46.9 | 17.6 | 29.4 |
| 1 | .7 | 48.4 | 14.1 | 20.1 |
| 1 | .8 | 49.3 | 9.8 | 12.2 |
| 1 | .9 | 49.9 | 5.0 | 5.6 |
| 1 | 1.0 | 50.0 | 0.0 | 0.0 |

us suppose we have a line carrying one ampere current. If we incease this by the addition of one ampere of like current, the losses will be 4; whereas, if we add one ampere of unlike current, the losses will be only 2. Now, every current of two amperes may be considered as made up of two like currents of one ampere each. If one of these could be replaced by an unlike current, the losses would be reduced in the ratio of 4:2. As has been shown above, when we combine an alternating and a direct current, the losses are $RI^2 + Ri^2$; that is, the losses are the sum of what the losses would be separately. *This means that each current acts as tho it had the whole conductor to itself and the other current were absent.* Accordingly, the conductors of an alternating-current system may be used also as the conductors for a direct current, exactly as if the alternating current did not exist, and vice versa. The losses are figured independently, being $RI^2$ and $Ri^2$. Inasmuch as line losses and line drop are proportional, *we may figure the line drop for the alternating current as tho the direct current did not exist, and figure the drop for the direct current as tho the alternating current did not exist.*

The line drops for the two currents are $RI$ and $Ri$.

*Why unlike currents do not interfere.*—That two unlike currents in no wise interfere may perhaps be appreciated from the following example. Suppose we have a direct current of ten amperes and add thereto an additional ampere of like (direct) current. The whole current is now eleven amperes which flows with uniform density in the conductor, so that the original current of ten amperes has only $\frac{10}{11}$ of the conductor for its use. An additional current of like kind, therefore, interferes with the original current. Let us now suppose that with an original direct current of ten amperes, we have an added ampere of alternating current. Half the time this is of the same polarity as the direct current, and increases the current density in the conductor; but half the time the alternating current is opposite in polarity to the direct current, and during this time makes the total flow of current less and the current density less than for the direct current alone. In other words, the additional ampere of direct current interferes all the time with the original direct current; whereas the additional ampere of alternating

Digitized by Google

current acts as a detriment for half the time, and as an assistance for half the time, these two effects tending to cancel.

*Discussion of Tables II, III, IV, and V.*—These tables show the saving in joint over separate transmissions under different conditions. On the basis of a given current density, Table II, there is a saving both in copper and in losses, which may amount to 29 per cent in each simultaneously. In Table III, the saving is in copper alone, and in Table IV in losses alone, running up to fifty per cent in each case. Table V shows the saving under very practical conditions, that is, one system is in no wise changed. This is the case where we already have an existing system installed and superpose a second current.

TABLE IV.

Saving in changing from separate to joint transmission, on the basis of the same amount of total copper.

| *I*, First current. | *i*, Second current. | Saving in total loss, %. | Saving in drop for *I* %. | Saving in drop for *i*, %. |
|---|---|---|---|---|
| 1 | .1 | 16 5 | 9.1 | 90.9 |
| 1 | .2 | 27.8 | 16.7 | 83.3 |
| 1 | .3 | 35.4 | 23.1 | 76.9 |
| 1 | .4 | 40.9 | 28.6 | 71.4 |
| 1 | .5 | 44.3 | 33.3 | 66.7 |
| 1 | .6 | 46.9 | 37.5 | 62.5 |
| 1 | .7 | 48.4 | 41.2 | 58.8 |
| 1 | .8 | 49.3 | 44.4 | 55.5 |
| 1 | .9 | 49 9 | 47.4 | 52.6 |
| 1 | 1.0 | 50 0 | 50.0 | 50.0 |

In designing a new composite system, a good rule to follow is to figure the conductors first for each system of conductors independently, and install the larger conductor only. The saving will then be as in Table V. Nothing is sacrificed and there is a decided gain.

*Extension of Profitable Radius of Distribution.*—Inasmuch as direct current can be transmitted on the whole more economically jointly with alternating current than separately, it follows that the radius of economic transmission of direct currents can be thus extended. We may draw a circle inside of which it is already profitable to transmit direct current by the usual independent system. In this circle, the advantage obtained from the joint transmission of direct and alternating currents comes from the greater profit on account of the saving already pointed out.

TABLE V.

Showing the saving when, of two systems carrying unlike currents *I* and *i*, at the same current density, the latter system is abandoned and the former system (unchanged) carries both currents.

| *I*, First current. | *i*, Second current. | First (*I*) system. | Second (*i*) system, copper saved, %. | Second (*i*) system, saving in line losses and drop, %. | Saving in total losses, %. | Saving in total copper, %. |
|---|---|---|---|---|---|---|
| 1 | .1 | Nothing | — | 90 | 8.27 | 9.1 |
| 1 | 2 | altered. | | 80 | 13.30 | 16 7 |
| 1 | .3 | Line | | 70 | 16.16 | 23.1 |
| 1 | .4 | drop | | 60 | 17.15 | 28.6 |
| 1 | .5 | and | | 50 | 16.67 | 33.3 |
| 1 | .6 | losses, | | 40 | 15.03 | 37.5 |
| 1 | .7 | weight | | 30 | 12.30 | 41.2 |
| 1 | .8 | copper | | 20 | 8.83 | 44 4 |
| 1 | .9 | as | | 10 | 4.80 | 47.4 |
| 1 | 1.0 | before. | — 100 % saved. | 0 | 0. | 50.0 |

We may draw a second larger circle within which it is profitable to transmit alternating and direct currents jointly for general purposes. Outside the first circle and within the second, the advantage in the joint transmission arises from the extension of the profitable territory covered. It is not possible to lay down any general rule for determining the size of those two circles, local conditions being controlling elements.

Beyond the second circle it is not profitable to transmit direct current, even in conjunction with alternating, for general purposes. However, direct current may then be transmitted to advantage, over alternating lines for special purposes, among the most important of which may be placed the starting of rotary converters, supplying magnetizing current for synchronous

Digitized by Google

motors, and the like. For these special purposes, the gain is not so much in the efficiency as it is in the increased engineering possibilities, the discussion of which is beyond the scope of this paper.

## APPENDIX.

### METHOD OF COMPUTING TABLES.

*Table I.* Resultant current $I' = \sqrt{I^2 + i^2}$. Fifth column is $(I+i)^2$; sixth column, $I^2+i^2$.

*Table II.* If the copper is worked with same current density, the saving in total copper is equal to the saving in total current. The total current is decreased from $1 + i$ to $I' = \sqrt{1 + i^2}$. The saving is $1 - \frac{I'}{1+i}$.

The saving in line losses, fourth column, is the same as the saving in copper on the basis of constant current density.

The line drop for $I$ and $i$ varies directly as the line resistance. For constant current density, $R = 1$, $r = \frac{1}{i}$ and $R' = \frac{1}{I'}$.

For $I$ the saving in drop is $1 - \frac{R'}{R} = 1 - \frac{1}{I'}$.

For $i$ the saving in drop is $1 - \frac{R'}{r} = 1 - \frac{i}{I'}$.

*Table III.* Equating the total losses for the joint and separate transmission,

$$R\,I^2 + r\,i^2 = R'\,I^2 + R'\,i^2.$$
$$1 + i = R'\,(1 + i^2).$$
$$R' = \frac{1+i}{1+i^2}$$

Here we have substituted $R = 1$, $I = 1$, $r = \frac{1}{i}$ (for the same current density in the two separate systems. In the joint distribution the weight of copper is proportional to $1 + R'$; in the separate distribution, to $\frac{1}{R} - \frac{1}{r} = 1 + i$.

Hence the saving is $1 - \frac{1+i^2}{(1+i)^2} = \frac{2\,i}{(1+i)^2}$.

For $I$ the saving in drop is

$$1 - \frac{R'}{R} = 1 - \frac{1+i}{1+i^2}.$$

This is always negative, showing an increase in drop.

For $i$ the saving in drop is

$$1 - \frac{R'}{r} = 1 - i\,\frac{1+i}{1+i^2}.$$

*Table IV.* For separate transmission the losses are $R\,I^2 + r\,i^2$. Putting

$$R = 1,\ I = 1,\ r = \frac{1}{i}$$

(for the same current density in the two separate systems) the losses become $1 + i$. In the joint transmission the losses are

$$R'\,I' = \frac{1}{1+i}\,(1 + i^2).$$

This is obtained by substituting

$$R' = \frac{1}{\frac{1}{R} + \frac{1}{r}} = \frac{1}{1+i};\ \text{and}\ I' = 1 + i^2.$$

The saving is accordingly $1 - \frac{1+i^2}{(1+i)^2}$.

The saving in drop for current $I$ is proportional to the change from

$$R = 1 \text{ to } R' = \frac{1}{1+i}.$$

This saving is $1 - \frac{1}{1+i}$.

For $i$, the resistance changes from $r = \frac{1}{i}$ to $R'$. The saving is $1 - \frac{i}{1+i}$.

*Table V.* The saving in copper, as far as the second system is concerned, is 100%, inasmuch as it is entirely displaced. The line losses and drop for the second system are diminished in proportion to change in resistance from $r$ to $R'$. The saving is $1 - \frac{R'}{r} = 1 - i$. Here $R' = R = 1$, and $r = \frac{1}{i}$, for same current density in the two independent systems.

The total copper is now proportional to 1 instead of $1 + i$, the saving being $1 - \frac{1}{1+i}$.

Separately the losses are $R'\,I^2 + r\,i^2 = 1 + i$. Jointly the losses are $R\,I^2 + R'\,i^2 = 1 + i^2$. The saving is $1 - \frac{1+i^2}{1+i}$.

## A NEW TELEPHONE MANUFACTURING COMPANY.

The Sumter Telephone Manufacturing Company is the name of a new concern, located in Sumter, South Carolina, the Massachusetts of the South, as some one has called that State. The plant just completed is one of the largest, embracing the latest mechanical ideas in automatic and other labor-saving machinery, placed in buildings especially designed for the Company.

The Sumter Company announces that it will build in its own plant the complete telephone, from the backboard to the binding-post. A complete line of up-to-date apparatus has been designed and is now being manufactured, so that shipments will probably be made before the end of the month.

The company wishes it to be understood that it has no connection whatever with any other telephone manufacturing company.

Digitized by Google

## BATTERIES FOR EXCHANGE USE.*

BY S. A. DINSMORE.

This is a subject which is very worthy of consideration by the owners, managers, superintendents and inspectors of all independent telephone exchanges, but one to which they have paid very little attention. There are no books or publications on this subject and very few independent telephone exchanges have or can afford to purchase the proper instruments for making practical working tests. There is every reason in the world why they should jump from one form of battery to another, but there is one thing that can be done when trying or testing different makes of batteries: that is, to make a written record of the conditions of the work each particular battery or set of batteries has to accomplish. By so doing you will soon have a record from which you can tell fairly well what make or type of battery will best perform certain or different classes of work.

I would advise every exchange to have a small low-reading voltmeter, which can now be purchased from any electrical supply house at a price ranging from $4 upward. This instrument will greatly facilitate matters in making tests, and also in inspecting the batteries on a telephone, which, by the way, should be regularly done. While a voltmeter test alone does not entirely cover the field, it is far better than nothing at all. It is a great deal better than a test made with the so-called battery gauges that are on the market. The scale of a battery gauge is a standard printed scale and the readings taken from one of them practically amount to nothing, no two of them reading alike. I have obtained different readings from the same gauge and from the same battery, not over a minute apart, which goes to show how unreliable they are.

With a voltmeter it is different. Each particular instrument is standardized and accurately calibrated, and the scale of each and every instrument is good for that instrument only, and any two or more instruments will give the same reading in volts, thus giving an absolute record.

In selecting a battery of any kind or type for use in connection with a telephone transmitter or microphone, always select one with a low internal resistance and a high recuperative power after it has been subjected to hard service.

Most of the modern and more recent makes or types of granular carbon transmitters have a minimum resistance of about 35 ohms and a maximum resistance of 75 ohms. Therefore it will readily be seen that what has been said before in reference to the selection of a battery for telephone use is of the utmost importance, and it would be well to follow it closely to obtain good results and a good speaking telephone.

For ordinary exchange use the regular type of carbon cylinder battery with a pencil zinc, using sal ammoniac or some of the more recent battery salts as an excitant, gives good results, but for a telephone that is to be used almost constantly a carbon battery with a large circular zinc will stand up better and longer and give better results. It will not polarize as quickly, and further, it recuperates more rapidly after prolonged or heavy service than the type of battery with pencil zinc.

In using batteries of the sal ammoniac type great care must be exercised in obtaining a good grade of imported chemically pure sal ammoniac. While it is my policy to uphold home products, in this instance I will state for the information of my hearers that sal ammoniac of American manufacture is not fit to be used in batteries, as it contains a large percentage of lead. This forms crystals on the zinc and in a very short time these crystals or needle points of lead salt come in contact with the carbon and short-circuit the battery.

I would advise testing every lot of sal ammoniac and if it does not come to standard reject it. A very quick and simple test for finding impurities in sal ammoniac is as follows: Heat a small portion of the sal ammoniac over a flame, such as a gasoline blow torch or an alcohol lamp. The impurities will be left while the sal ammoniac will pass off in white fumes, in which the smell of am-

* Read before the Illinois Telephone Association, Fourth Annual Convention, Chicago, June 6 and 7.

Digitized by Google

monia gas will be very perceptible. If after heating several times there is any great amount of foreign substance left the sal ammoniac is of a poor quality. Another good test, but which is not quite as easily performed as the foregoing, is — add to a solution of sal ammoniac a small quantity of hydrochloric acid and barium chloride. If the mixture becomes discolored and a sediment is formed the sal ammoniac is impure.

It often occurs that little judgment is used as to the amount of sal ammoniac required to recharge a battery, many persons being simply guided by guesswork, and in nine cases out of ten too much is used. I distinctly remember one instance where I cautioned a man about the amount of sal ammoniac he was using, and out of curiosity I weighed up the amount that had been placed in one of the batteries and found that nearly three-quarters of a pound had been used. If this quantity had been left in the battery, the zinc would soon have become coated, thus causing the battery to short-circuit itself and waste all its energy.

It is a good plan, if sal ammoniac is purchased in bulk, to weigh and put it up in packages of a sufficient amount to charge one battery. From four to six ounces of good, pure and clean sal ammoniac makes the best solution.

Another point that bears looking into is the quality of the zincs used; in every case they should be well amalgamated. Cast zincs should never be used, as they are very porous and are usually made from old scrap zinc and are likely to contain such substances as iron and other metals, which are very detrimental to the battery, and will in time cause it to become internally short-circuited. By using a zinc which is sheared from rolled sheet zinc trouble from this cause may be entirely eliminated. Zincs of this kind are carried in stock by all leading electrical supply houses and are designated as "cut zincs." These cost no more than the cast zinc, and, in the end, taking into consideration the amount of work accomplished by each kind of zinc, you will find that the cut zinc will cost but a trifle over half.

Some makes of dry batteries are giving good results, but the majority of them can not stand the heavy work they are called upon to perform in telephone exchange usage. I have found in making tests of dry batteries all sorts of material used with the depolarizer as an absorbent, such as sawdust, tanbark, cotton, and, in one instance, plaster of paris. The use of such material gives them a high internal resistance and a slow recuperative power, which is just the opposite result to that which is so necessary for a perfect working telephone exchange.

I have frequently been asked the question, "How long will a battery retain its working power before it has to be recharged?" This is one of those conundrums which can be best answered by the story of the little brown jug: "The oftener you go to it and the longer you stay the sooner you will have to go to the store for more."

To those using the Callaud or gravity battery for operating switchboard transmitters, I do not think a few points as to their care and maintenance will come amiss, as there is very little literature on this subject and a great deal of trouble caused by their use can be traced directly to the lack of information as to their care. To set up the battery properly, pour into the jar clean water until it covers the zinc, which has previously been placed in position. Then drop in blue vitriol in small lumps, not over eight ounces being used in each battery. The battery may be made ready for immediate use by adding to the above solution four ounces of sulphate of zinc, which must be pulverized so that it will dissolve immediately.

Blue vitriol should be dropped into the jar, as it is consumed, care being taken that it goes to the bottom. The need of the blue vitriol is shown by the fading of the blue color, which should be kept as high as the top of the copper, but should never reach the zinc. After the battery has been started no further attention is required, except to keep it supplied with blue vitriol, until the quantity of sulphate of zinc solution has become too great. In that case draw out a portion of the top of the liquid with a syringe or a cup and replace it with clear water.

A hydrometer is convenient for the purpose of testing the strength of the solution. When the specific gravity is

Digitized by Google

less than fifteen degrees there is too little sulphate of zinc and blue vitriol should be added; when it is thirty degrees or over there is too much sulphate of zinc in the solution and it should be diluted with clear water, as before stated. The specific gravity of a battery in good working condition should be from twenty to twenty-five degrees.

When the zincs become coated so as to interfere with the action of the battery they should be taken out and thoroughly scraped clean and be well washed.

In reference to the use of the hydrometer, which should be of the special type manufactured to be used for testing gravity batteries, place it in the solution of the battery to be tested with the weighted or large bulb end down, when it will float, the top of the solution acting as a pointer or indicator; thus if the hydrometer sinks into the solution, so that the top of the solution is even with the 20 mark of the scale, this will denote the specific gravity or strength of same.

The reason I have gone into detail as to the use of the hydrometer will be explained by the following, which is an extract from a letter received from the manager of a prominent telephone exchange, but I am glad to say that he does not hail from this State:

GENTLEMEN,— Several days ago we received from your house a gravity hydrometer, but have failed to make it work. We have held both the large and the small end of the tube in the solution for a period of several minutes at a time and have failed to see any change on the inside of the bulb.

While there are a great many other types of batteries, I have only taken up the ones used most extensively for telephone purposes.

---

PENNINGTON, VA.— The Pennington Telephone Company has been incorporated to operate and maintain telephone lines. The capital stock is $5,000, and the incorporators are W. H. Nickels, J. C. Parish, J. N. Duff and others.

SPOTSYLVANIA, VA.— The Spotsylvania Telephone Company has been incorporated to operate a telephone exchange. The capital stock is $5,000, and the incorporators are J. O. H. Crismond, T. A. Harris and others.

## THE MANUFACTURE OF WIRE FOR TELEPHONE PURPOSES.*

The properties of wire for telephone work may be considered under three headings, namely, Conductivity, Mechanical Strength, and Durability.

### CONDUCTIVITY.

A unit for expressing the resistance of a wire to a current of electricity is the mile-ohm. It is given as a weight in pounds of a cylindrical conductor one mile in length, and having a resistance of one ohm. The mile-ohm for copper is 859 pounds, calculated for international ohms; for E. B. B. iron, 4,700; for B. B. iron, 5,500; for steel, 6,500.

For copper the mile-ohm will vary very slightly, accordingly as it is hard drawn or soft drawn, the latter having the smallest mile-ohm; that is, having the best conductivity. For conductors on poles, a hard-drawn wire is used; for conductors in cables, a soft one. The conductivity of copper wire, however, is more frequently specified by the percentage of the Matthiessen standard, which gives the resistance of one foot of copper $\frac{1}{10\,00}$ inch in diameter at a temperature of 32° Fahr. as $91\frac{77}{100}$ international ohms. Electrical engineers generally specify that soft-drawn copper shall have a conductivity equivalent to ninety-eight per cent of this standard, and hard-drawn copper about ninety-seven per cent.

For iron wire, however, telephone and telegraph engineers generally specify their conductivity by the number of pounds per mile-ohm. The differences of conductivity in iron wire are due to the specific conductivity of the pure metal used, namely, iron and zinc, and also the percentage of carbon used in the manufacture.

### MECHANICAL STRENGTH.

In the manufacture of copper wire, pure metal is used. There are differences in the product of different mines, lake copper being generally considered the purest. The strength of the copper wire is proportional to the number of

*Read before the Illinois Telephone Association Fourth Annual Convention, Chicago, June 6 and 7.

Digitized by Google

holes through which it is drawn, and in drawing it becomes, after a certain number of holes, too hard, and must be softened again by an annealing process. The holes above referred to are made through cast-steel blocks, which act as dies ; and a number of holes, technically speaking, means a succession of dies, each hole being smaller than the one preceding it.

The drawing of copper wire forms on the outside surface a hard shell, the strength of which seems to be much greater than that of the body of the wire, so that a slight nick on the outside surface tends greatly to decrease the tensile strength. In a wire of small diameter, the proportion of hard shell to the total mass is, of course, greater than in one of larger diameter, and consequently a small wire is, in proportion to its cross section, stronger than a larger one. As an illustration, the specifications of the American Bell Telephone Company call for a tensile strength in a No. 14 B. & S. gauge copper wire of 68,200 pounds per square inch of cross section, whereas for No. 6 B. & S. gauge wire they call for only 62,100 pounds per square inch of cross section.

Illustrating the differences in strength between a hard and soft drawn copper : A hard-drawn copper wire, No. 14, has a tensile strength of 220 pounds, while soft-drawn copper has a tensile strength of 109 pounds. No. 6 B. & S. hard drawn has a tensile strength of 1,328 pounds, and soft drawn 700 pounds. A convenient expression for tensile strength is to combine the weight and strength per mile, that is to say, a No. 14 B. & S. gauge hard-drawn copper wire has a tensile strength of 3.38 times its weight per mile.

Iron wires for telephone and telegraph use are generally classified as E. B. B., B. B., and steel. The first named is always used by telegraphers on account of its better conductivity ; this is obtained, however, only by a sacrifice of strength. Of the three grades, E. B. B. has the greatest conductivity and least strength ; steel the greatest strength and least conductivity. Telephone users have generally adopted a compromise between these two, and use the B. B., which has a tensile strength of 3.3 times its weight per mile, as against a strength of 3 times per mile for E. B. B., and 3.7 times for steel.

Other tests applied to wires in connection with their mechanical qualities, are :

First : A trial of its elongation before breaking, which in hard-drawn copper is standardized at $\frac{8}{100}$ of one per cent in a length of 5 feet ; and in E. B. B. iron wire of fifteen per cent in the same length.

Second : A trial of the toughness, which consists in the determination of the number of twists in a sample 3 or 6 inches in length. By the British P. O. specifications these twists for No. 12 B. & S. gauge wire are about 30 in 3 inches. They also specify that the wire shall be capable of being wrapped in 6 turns around a wire of its own diameter, unwrapped and again wrapped in 6 turns around wire of its own diameter in the same direction as the first wrapping, without breaking.

The twist tests are specified as follows : The wire will be gripped by two vises, one of which will be made to revolve at a speed not exceeding one revolution per second. The twist thus given to the wire will be reckoned by means of an ink mark, which forms a spiral on the wire during torsion ; the full number of twists will be visible between the vises. Iron wire, Western Union specifications, shall stand 15 twists in 6 inches.

The strain upon any wire on a pole-line is directly proportional to the weight of wire in span and inversely proportional to the dip. The strain upon any span is greater for a large wire ; but the large wire is proportionally stronger than the small one. A common practice in comparatively warm climates is to use forty poles to the mile and allow 3 inches dip at center of spans, but where the variation of temperature is considerable, as in this part of the country, 10 inches is allowed in summer and 8 inches in winter. This applies both to the copper and iron wire.

It is possible to make a span 3,000 feet in length which will withstand differences in temperature, sleet, wind, etc. As an illustration, take a No. 12 B. & S. iron wire with supports of even heights, 3,000

Digitized by Google

feet apart, and a dip of 63 feet at the center. The resultant strain is about 550 pounds. A special steel wire can be furnished having a strength of 10 times its weight per mile (or 1,650 pounds) giving a factor of safety of 3. This special steel is the only material that can be successfully used for that length, as will be seen by the following comparison :

Ordinary B. B. iron has a strength of 3.3 times its weight per mile. Hard-drawn copper, 3.38 times its weight per mile. Ordinary steel wire, 3.7 times ; phoshor or silicon bronze, 5 times ; aluminum, 6 times ; special steel, 10 times.

In cables or rubber-covered wires the mechanical qualities are a minor consideration ; a soft-drawn copper of the highest conductivity is used, the tensile strength of which is unimportant.

A brief description of the methods of manufacture by which the various necessary electrical and mechanical qualities are obtained may be interesting.

The copper and iron come to the factory in what are variously called ingots, blooms or pigs ; these are masses of metal about four inches square in cross section and two or three feet long. The first process is to pass these ingots thru a series of rolls, from whence they come out in the form of rods either $\frac{5}{8}$ inch or $\frac{1}{2}$ inch in diameter. This is the way all metal is treated before the drawing process is commenced.. The rods are taken from the rolling mill and cleaned in acid baths to remove the scale of oxide caused by heating and rolling, and then drawn thru the dies to the required size. The wire is then ready for annealing, after which, in the case of iron wire, it is taken to be galvanized with a coating of zinc spelter. A covering of silk or cotton is put on, or a braid or series of braids, as required. In the case of rubber-covered wire, the copper is run thru a bath of melted tin, thereby receiving a uniform coating of that metal. This is done to preserve it from any deterioration, which might be caused by the ingredients of the rubber compounds. The rubber is put on the wire in two ways — either as a seamless tube in which the rubber is heated and squeezed out uniformly around the wire ; or, it is put on in strips in two or more operations with the joints squeezed, then braided, then vulcanized. After the vulcanizing process the braided wire is treated with a coating of weather-proofing material.

The wires are then subjected to various tests, the iron wire to mechanical tests and a test for the galvanizing coating, also electrical tests for conductivity. The hard-drawn copper wire for telephone use is subjected to electrical and mechanical tests and rejected unless it meets the required specifications. The rubber insulated wire is immersed in a water bath for forty-eight hours, then tested for insulation, electrostatic capacity and breakdown.

### DURABILITY.

Except under unusual conditions, such, for instance, as an atmosphere charged with sulphur fumes, a hard-drawn bare copper seems to resist corrosion for an indefinite period. After a short exposure to weather there is formed over it a green film of less than $\frac{1}{1000}$ inch in thickness. This film or coating apparently acts as a preservative of the metal beneath it and does not extend deeper. Troubles which occur with copper wire in telephone practice are largely due to the prevailing method of tying to insulators. In twisting the tie wires around the main conductor sufficient heat is generated to anneal it slightly and thereby impair its strength; this by linemen is called "burning" the wire. The tying also kinks the main conductor, and the tools of the linemen abrade the outer shell. After the wire has been up for a certain length of time it is necessary to take up slack, and this operation is frequently repeated two or three times; as the pulling up gives the "burns," abrasions and kinks new positions, the condition of the wire in time is one having a considerable number of weak spots, which occasion breaks under such strains as are caused by high winds, sleet, contraction in cold weather, etc.

The tying of iron wire produces results somewhat similar, with the difference that the abrasions and twistings tend to peel off the galvanizing and expose the inner metal to rust. In this connection it might be stated that the galvanizing of iron is a matter of great importance.

Digitized by Google

The following test is used to determine whether it has been properly done: The wire will be plunged into a saturated solution of sulphate of copper and permitted to remain one minute and then wiped clean. This process will be performed four times. If the wire appears black after the fourth immersion it shows that the zinc has not all been removed and that the galvanizing is well done; but if it has a copper color, the iron is exposed, showing that the zinc is too thin.

It will be seen that there can be wires and wires. I have tried to give you in condensed form the principal points which must be kept in view by the wire manufacturer, and to show that much of your success in operating lines depends upon the care and honesty exercised by that patient party. He does not object to occasional severe criticisms; he is used to it and it probably does him good. The moral of the story is to advise you to trade with an honest and painstaking maker; to buy good material and to pay fair prices for it.

---

## A PROFITABLE FIELD FOR EXTENSION IN SMALL EXCHANGES.

There are a great many exchanges that have been gradually adding to their subscribers until it seems as if they had installed all the 'phones that there was room for within their territory; and while their investment has been a profitable one, they begin to bemoan their limitation and look about them for any possible means of extension; for it is not natural for those who are ambitious to feel that there is not much room for progress. The addition of auxiliary sets with certain subscribers helps not only to increase the revenue, but also the value of the 'phones to each party connected with the exchange; and as such additions are made without increasing the line investment, many exchange managers have made particular efforts to secure this class of business. There is another field, however, that has not yet received the attention it deserves from the telephone companies; yet it is one that with little effort can be made to yield a nice addition to the business of the exchanges. We refer to intercommunicating and interior telephone systems. This is a class of business that can be easily handled by telephone companies, who usually have in their employ men who could readily undertake their installation and maintenance; while from the fact that they could make arrangements to connect these different interior systems with the regular exchange, they could offer inducements not in the power of the usual electrical contractor. The field for such installations is a very wide one indeed, and there is scarcely a town, no matter how small, where several could not be put in.

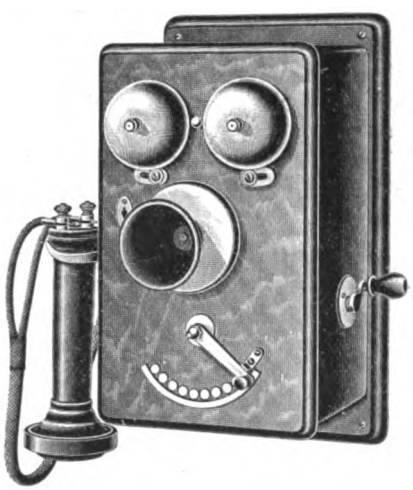


FIG. 1.

Banks, mills, public institutions and even private residences could all with advantage use several telephones to connect their various departments; while it is easy to arrange that each and any station in such a system can call up the exchange. There is one thing that is certain, however; that is, that nothing but high-grade instruments should be used for interior work; for not only are such instruments called upon for a great deal more service than the usual exchange 'phones, but are also likely to be more subject to severe usage. What has retarded the development of these telephone systems more than anything has been the poor class of apparatus

Digitized by Google

usually installed, some contractors evidently believing that interior telephones were inferior telephones, probably in basing their estimates, reasoning on the fact that if it took but a ten-dollar instrument to talk ten miles, an instrument for short-distance use should be proportionately cheaper.

The Holtzer-Cabot Electric Company, recognizing the large field there is for this class of intruments, carefully studied the requirements, and has placed on the market the Ness Automatic Telephones for such purposes. These 'phones can be used for any class of service; are wired for either centralized or local batteries, for magneto or battery call, and are arranged to meet the widely varying requirements of interior service. The 'phones are high grade in every respect, present an ornamental appearance and are equipped with receivers and transmitters equal in construction to those used on long-distance instruments. The principal feature, however, is the automatic return of the switch-lever to its home point on replacing the receiver. This prevents the possibility of the system becoming disarranged thru any one forgetting to make proper disconnection and replacing the switch after using. This last feature makes them especially applicable for use in connection with the local exchanges, as, if such a switch were not provided, there would be a possibility of a great deal of annoyance and inconvenience being experienced at the exchange where some party had left the switch on the "exchange" line.

Fig. 1 illustrates one style of instrument made by this company which is equipped with magneto bell. There are, however, a number of other styles to select from. The company issues a new booklet which not only illustrates the different forms of instruments, but gives a very full description of the method of operation and a number of diagrams showing different methods of wiring, which will be sent to any one interested upon application.

---

"CAN'T keep house without it."
F. B. PATTEN.

## ARRANGEMENT AND EQUIPMENT OF NEW EXCHANGES.

BY THE INSPECTOR.

### LOCATION.

Supposing that you are about to start as a new company in business, it is quite important that you should be well located. In this respect you might well pattern after the telegraph and express companies, who generally manage to secure the best corners on the most prominent streets. With the old order of things the exchange was apt to be located in the top story of some unpretentious building. If you had asked the people of the town where the exchange was, only about one in five could have answered intelligently, while perhaps half could tell only that it is "somewhere in such and such a block."

Of course an exchange so located could give as good service as any, but this policy of monastic isolation will not answer with a company "just come to town," for it must achieve its way against the wiles of a rich, resourceful and not overscrupulous antagonist. Therefore you must get as near the people as possible; take them into your confidence, select a good location, easy of access; put out signs on the windows and over the doors until every man, woman and child in town knows who you are, where you are and what you are there for. Nor should it be forgotten to have the office so arranged that you can invite visitors to come, and make them welcome. You may have to hire an extra boy to show them around, but the amount of free advertising you will receive will make it pay.

It is not to be supposed, however, that you will select the noisiest location in town, where trucks and street cars are continually passing, as that will interfere with the operating service.

In selecting a room for the placing of the switchboard try to secure one that is cheerful, well lighted and ventilated, and large enough for all future needs. Thus, if the exchange begins business with two hundred subscribers, place the board in a room large enough for seven hundred. This may seem extravagant, but the experience of the past and prospects for the

Digitized by Google

future justify it. Then when increased business comes, as it will if the exchange is properly equipped and managed, there will be no necessity for tearing up things and changing the location — always an expensive proceeding.

We have spoken of the desirability of inviting the public to visit the exchange. This, however, does not mean that the people generally are to have free access to the board to annoy the operators ; a railing, close enough to let them see everything going on, but far enough away to keep them at a respectful distance, is generally advisable.

EQUIPMENT.

The only reason why any of the new exchanges fail is for lack of proper equipment, which is not only a source of expense to its owners but of disgust to subscribers, who, tiring of inefficient service, finally withdraw their patronage and go over to the other company.

On the supposition that the new company is in business to stay, it will pay them to put in good switchboards, good instruments, substantial line equipment, and at least one man who knows how to take good care of them.

It is possible to buy some switchboards at a very low figure, but it does not pay.

It is also possible to buy $5 telephones, but they are only fit for boys to experiment with.

Before buying, study this matter of equipment. Select the instruments best suited to your needs and then buy all your other instruments of the same kind. Do not keep trying every instrument made, till the exchange is like a museum.

In up-to-date exchanges, grounded circuit boards are no longer considered, even tho grounded circuits are used. It is true that in many places grounded circuits will give good service, but use only a metallic circuit board; for with the extension of toll-line service some subscribers will demand metallic circuits, and should a trolley road be built within half a mile of the exchange, grounded lines will have to be discarded and a common-return or metallic-circuit system substituted. Many small boards, even, are arranged with a strip of drops for toll-line service, the only difference being in the winding of the toll drops to 1,000 or more ohms. Then the exchange is in a position to supply metallic circuits, common return, party or grounded lines all out of the same board. The difference in cost between a ground or single-line board and a metallic circuit is very slight compared to the saving in the future.

Having decided upon a metallic circuit board, the metallic system (two wires) should be carried out to the cable pole, where one side of every pair of wires can be connected to the return or ground wire. Note — When you open up a paired cable you will perhaps notice that one wire of each pair is red and the other white. Select the red wire, or vice versa, at the "ground" wire and connect nothing but reds to the ground or return strip. Follow this system right back to the board, making connection to the right-hand side of the board clips red and the other white, which must be followed thruout the board. The advantage of this plan is, that the drops, if grounded, are uniformly grounded ; then if there is trouble on one leg of the circuit it can be traced by its color from the board to the line.

Exchanges of two hundred subscribers or over should not consider grounded lines at all. Use either metallic circuits, or, the next best thing, a copper wire return, except, perhaps, for the very longest lines, and ground these only where sure a good ground can be obtained. Then it may become necessary to ground the return wire. In such a case ground all your return wires in one place at the central office. Do not ground them on the lead sheath of the cable, as the cable will probably be grounded at both ends and the ground effect will be too much spread out. Ground only in one place. There is a notion, especially among old telegraph men, that the resistance of the earth is practically nothing, but this is a mistake, as even the best ground is apt to have considerably greater resistance than a mile of line.

With both sides of the circuit carried to the cable pole the ground wire can be disconnected from the bus-bar and carried outside any time it is desired to make any line metallic.

Digitized by Google

But another reason for keeping the metallic form of circuit intact thru the cable lies in the fact that single wires, run thru a cable, have a very bad tendency toward cross-talk owing to the proximity of other wires in the cables, which, however, is obviated by keeping the two sides in a twisted pair thruout the cable.

### THE BOARD.

The switchboard should be well made mechanically and well insulated electrically. There is no reason why, with the exception of a burnt-out drop occasionally and a few other trifling repairs on cords and plugs, it should not be built to last twenty years. The weak point in some makes of boards is in the jack springs, which become loose and uncertain in their action after two or three years' wear. If they are made of heavy German silver with a firm rubbing contact this will not occur.

The ringing and listening keys should also be well and substantially made, for the wear on a cam in the course of a year is considerable, and if you can find a cam that you think will never wear out so much the better. In the matter of plugs and cords there is also a great deal of difference among different makers. There is no way yet discovered by which a cord will not wear out or a plug give trouble occasionally, but some are much better in this respect than others.

### CROSS-TALK.

The switchboard is sometimes blamed for all the cross-talk in the system regardless of circumstances. We can lay it down as a general proposition that the cross-talk complained of does not legitimately belong to the board, providing it is reasonably well insulated. Experiments with all kinds of coils thrown together in every conceivable position have shown only in rare cases the slightest trace of cross-talk as long as they were not connected together. In at least nine cases out of ten cross-talk can be traced to leakage, as in damp cables or in trees thru which the wires run, or to resistance in the return wire. (Let us say that the size of the return wire once adopted should be carried out thruout the system.)

There is, however, one cause of cross-talk that must not be overlooked as applied to a common-return or grounded system, which is that of low-wound drops and ringer coils, which will allow of considerable leakage from one line into another unless a very large return wire is used, and even that will not entirely stop it, as in a system of this kind all lines are connected together in multiple thru the ringers and drop coils.

The following formula may be used in finding the proper resistance of the return wire:

$$Rc = \frac{Rd + Rr + Rl}{Rn}.$$

$Rc$ = resistance of copper wire for the *average* length of line wires.
$Rd$ = resistance of the drop.
$Rr$ = " " ringer.
$Rl$ = " " line (average).
$Rn$ = number of lines on a lead of poles.

Manufacturers now, however, almost obliterate the cross-talk of common-return systems by winding the drop coils to a higher resistance, from 300 to 500 ohms, and the ringers to correspond, which tends to keep the return current to the return wire where it belongs, or distribute it evenly over the entire system. To further prevent even a suspicion of cross-talk in the board, some switchboard makers enclose the drop in an iron tube or shield so that we have not only the high resistance of the drop, but the impedance and screening effects of the shield, which will surely prevent it if the return wire is large enough.

One cause of annoyance is sometimes to be found in the wire used in the office to connect with the cross-connecting board. The cheap grade of annunciator wire often used for this purpose will absorb a great deal of dampness from the air. To prove that this is the case, plunge a bundle of it into boiling paraffin. The bubbles that you will see are all caused by dampness, and it will surprise you to see how many bubbles will arise.

Most of the better class of exchanges now use for their interior wiring a wire wound with two layers of silk, outside of which is a cotton winding. This

Digitized by Google

when made into form, boiled in a mixture of equal parts of paraffin and beeswax and afterward shellaced, makes a good inside cable, tho, if the lead to the cross-connecting board is a long one, rubber or lead-armored paper cables are better; yet paper is better on account of its lower capacity.

## A NEW AUTOMATIC SLOT TELEPHONE.

Realizing the constantly increasing demand for an automatic slot telephone for pay stations, the Chicago Telephone Supply Company has just placed on the

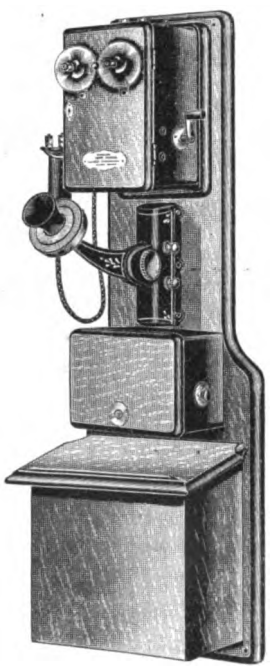


FIG. 1.

market the Chicago Telephone, Model 15 (Fig. 1), which is a regular exchange telephone equipped with the Chicago automatic slot mechanism.

The telephone proper has a 25,000-ohm generator, solid back transmitter, bi-polar receiver, long lever automatic hook, long-distance induction coil, and backboard with battery box for two wet cells. The automatic slot mechanism can only be adjusted for operation by one coin, but that coin can be of any denomination from 5 cents to $1. The mechanism is adjusted to both size and weight of coin. It is encased in a metallic box, handsomely finished in black enamel.

The theory is to bridge a vibrator across the transmitter circuit when the coin is deposited and button pressed. This conveys a positive signal to operator at central. The mechanism is very simple in construction and fully covered by basic patents. The trade is warned against using apparatus which may infringe on patents issued to H. G. Sweeny. The Chicago Telephone Supply Company has the exclusive right to manufacture under such patents.

Such a slot telephone is a moneymaker from the start, as it relieves all concerned from the annoyance of those who can not afford the dollars for telephone service, but who have no compunction in using the other fellow's 'phone.

The Chicago Telephone Supply Company is prepared to make prompt shipments on all orders for automatic slot telephones.

The company also states that the demand for Chicago Express switchboards is beyond all expectations and that their instant appreciation by exchange managers has already necessitated a considerable addition to the switchboard department.

## TO REPLACE THE BELL.

BALDMOUNT, PA.—The Newton, Ransom and Lake Winola Telephone Company has been incorporated with a $3,000 capital stock.

PIPESTONE, MINN.—The Farmers' Telephone Exchange Company, of this city, has been incorporated to conduct and operate a telephone exchange. The capital stock is $100,000, and the incorporators are T. F. Robinson, O. Cass, W. Frost and others.

DUBUQUE, IOWA.—Articles of incorporation were filed today by the Dubuque Telephone Company, with a capital stock of $50,000. The company will operate over fifteen other lines covering northwestern Iowa, a part of Wisconsin and Minnesota. The directors are B. F. Blockinger, J. M. McFadden and others.

Digitized by Google

## SOME NEW "CENTRAL" TELEPHONE DEVICES.

The Central Telephone & Electric Company, St. Louis, is manufacturing some new designs in cross-connecting and distributing boards, which contain several new features of merit.

Fig. 1 represents a section of the cross-connecting and fuse-distributing board. The cross-connections are mounted on black fiber, which in turn is attached to a highly polished oak

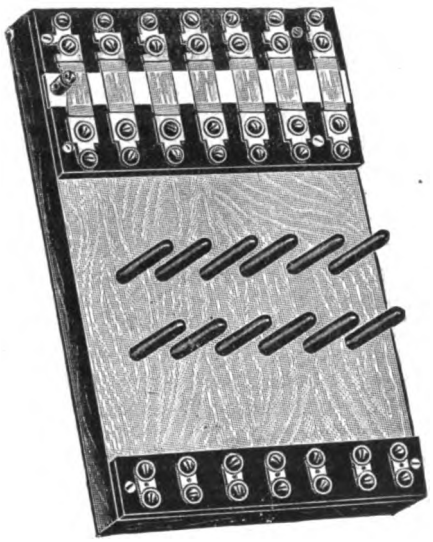


FIG. 1.

board. The fuses used in distributing board are the ordinary postal style, which can be purchased from any electrical supply-house; the fuse strips are attached to fiber on lower side, which places them within 1-32 of an inch of the ground plate, which runs the full length of the board. The cross-connections are run thru the wooden pegs, which prevents tangling wires and makes the tracing of circuits an easy matter. In Fig. 2, the Central Style Combination, carbon and fuse distributing board is illustrated, which is claimed to be the only combination arrester on the market where connections can be made on both sides without crossing either the carbon plates or ground connections, and this makes short circuits between line wire and ground impossible. Another good device is the Central Style Carbon Lightning Arrester and Distributing Board, the advantage in this being the fact that distributions to line wires and cable can be made from both sides. The ground plate and carbon in center of board, insulated from connections, except one side of carbon. Looping line wires, as on ordinary carbon arresters, is unnecessary with this.

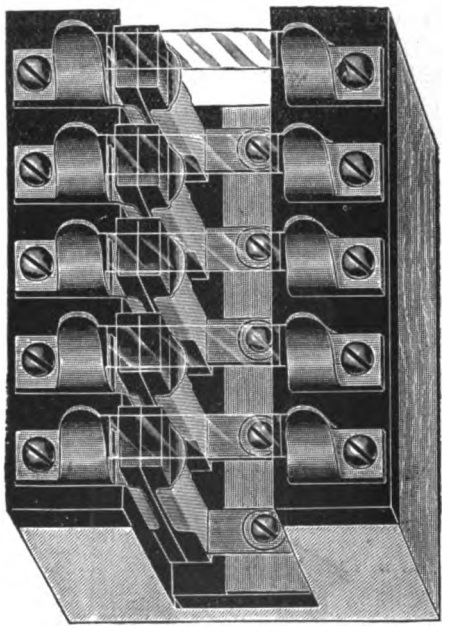


FIG 2.

The Central Telephone & Electric Company is placing these goods in a great many exchanges, and also reports that its business in telephone instruments, switchboards and supplies has increased over 200 per cent in the last year. The company's catalog No. 6 illustrates its line of distributing boards, cross-connecting boards and fuse blocks, and gives net prices on all construction material used with telephones. This will be sent to any one on application and the name entered for the new No. 7 catalog, which is now in preparation, and which will illustrate the latest improvements in telephone instruments.

Digitized by Google

# TALKS AND CROSS-TALKS.

BY THE INSPECTOR.

## HINTS TO CORRESPONDENTS.

Write on one side of the paper only, and make sketch or diagram, when necessary. Endeavor to give all the facts bearing on the case, so as to enable the editor to answer intelligently.

Name and address must accompany each letter, not for publication, but for the information of the publisher.

## FOLLOWING THE BELL.

One of the greatest troubles at the present time among managers of new exchanges is to get first-class construction men, men who can take care of the work and lay out systems intelligently. It is easy enough to get good linemen, men who know how to climb and tie in wires, but that is considerably different from first-class telephone work ; for men who understand how corners should be guyed, how to take care of their wires when up and how to handle cables are not as plenty as some of us seem to think.

Many of the new managers, knowing their own lack of experience in such matters, think that if they can secure a lineman from our friends, the enemy, that the work must surely be done right. Now, let us whisper in your ear that the man who has worked for years for the "Bell" Company may not be up to date and a great many of them are decidedly behind the times. One mistake sometimes made in building new exchanges is, that they are content to build as well as the "Bell." This is all very well, but the exchange that contents itself with building as well as the "Bell" has done in many of their exchanges in the past is very liable to be left in the race for business. This may seem strange to some who, having seen the newer work of the "Bell" Company, regard it as fine engineering. This is all true enough, but the fine engineering of the "Bell" Company is confined almost exclusively to work where opposition is, or is to be expected. There is no question about the fact that when they think it necessary, they possess the engineering talent to do first-class work ; but this does not apply to their old work, nor does it apply to the older class of service.

There is one thing that the new manager must not forget, and that is, if they lay out their work and make their calculations accordingly they will do twice or three times, perhaps four times, the present business of the "Bell" Company in their locality, and a line that might be adequate for say thirty or fifty subscribers would fail completely when loaded down with two hundred. If you must have "Bell" construction men, try and procure men who have worked for a year or two on their newer exchanges and then give them material for doing good work.

Saving money on construction work is very apt to prove expensive economy in much less time than you think.

Again, "Bell" operators are not apt to be a success in the "new exchanges" for the reason that they have been used to taking their own time in answering calls and neglecting certain patrons against whom for certain reasons they may entertain a dislike which the public will not stand from the "New Company." Competition makes people exacting, and the poorest of the new companies must give better service than the old has given, even in a city like Chicago.

## TO GROUND OR NOT TO GROUND.

39. Which is considered best practice in stringing lead-covered aërial cables: to ground the cable and carrier wire or to carefully insulate the cable and carrier wire? One method is used by the Bell Company here, while Independent companies use the other.

H. S. K.

Where the ground or common-return system is used it is generally considered best to ground the cable, the carrier wire being generally grounded anyway thru slugs or anchor rods. With a com-

Digitized by Google

plete metallic system, however, especially where the central battery system is used, it is considered best to insulate the cable as thoroly as possible in order to prevent possible trouble.

MONITORS.

40. I have four metallic switchboards to which I want to connect a chief operator's set so that she can connect to either board by switch or push-button. Kindly publish drawing showing how to connect same.

P. F. S.

WANTS TO KNOW.

41. Where I am working we frequently have cables that get water-soaked by having a hole in them. What I want to know is how to find the bad places. R. S. C.

In the case of underground cables, finding a hole in the cable is a very difficult and somewhat complicated matter, and requires careful measuring with

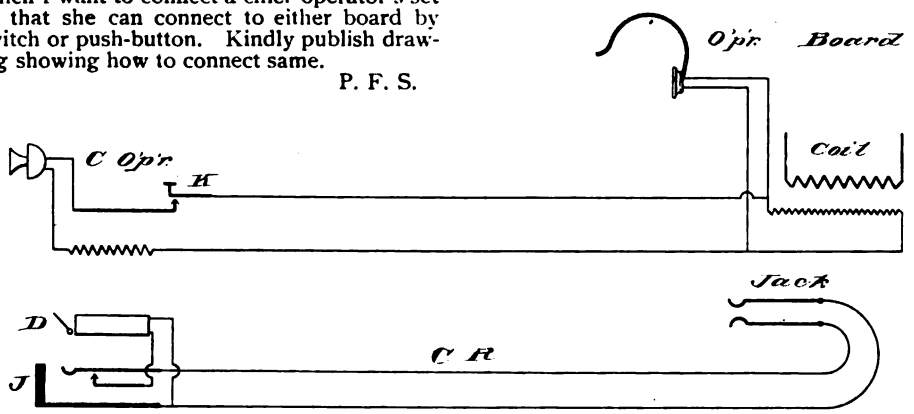



FIG. 1.

There are two or three methods by which this can be done. It can be readily seen by the diagram shown above (Fig. 1) that the main idea is simply to leg in on the operator's set, so that the chief operator can cut in by simply depressing a key or push-button.

In order that the operator may cut in on the chief operator an open jack is placed on the board into which the operator can insert a plug, throw a drop on the chief's desk and communicate in the usual way.

This can be duplicated in the rest of the sections. Of course the chief operator has only one telephone which is connected in multiple with all the buttons K, there being one button and one drop for each section of board.

either a Wheatstone bridge or a high-grade astatic galvanometer. Where the bridge is used the best method is probably the combination of direct measurement and the Varley loop method. Of course, it must not be forgotten that the resistance of the water in the cable, while it will produce a cross so far as ringing and talking is concerned, may yet be very high, perhaps some hundred ohms,

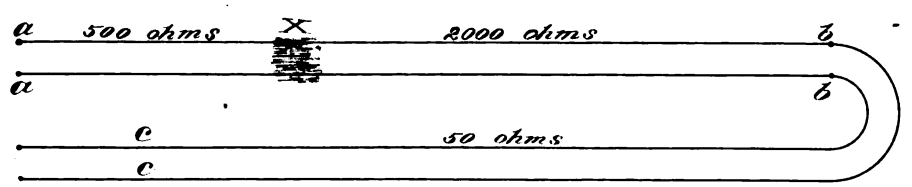



FIG. 2.

and that calculations must be made accordingly. Where a cable is water-soaked, of course, the probability is there will be many conductors all water-soaked at the same time. Now, suppose we begin as in Fig. 2 in which *a a'* are the cable conductors crossed by a damp place in the cable at X. Suppose that in measuring up the terminals of the

Digitized by Google

galvanometer are connected to the ends *a a'* and the resistance between the two is found to be, let us say, 500 ohms. Now, the resistance of our conductor (because all cables should be measured when completed and in large installations they generally are) is known to be, say, 40 ohms to the mile. It is plain, therefore, that 500 ohms would indicate something like eight miles from the office, if this method alone were used; but it is also plainly evident that there must be a considerable resistance between the two conductors where the cross is caused by dampness at X. We might also measure up several other conductors and in this way get a fair average, as the damp spot at X would probably give all of the crossed wires approximately the same resistance. This, then, would indicate the dampness and indicate a break in the cable sheath. So much for the direct method. But this would still not tell us where the wet place in the cable was. We must go about that in another way. Now, there are two things we can do: either go to the two ends of the cable marked B B' and test from there back to the spot X, or take two more wires, C C', whose resistance is known, or at least can be measured, and have an attendant at the other end connect them to the terminals *b b'*. Now, suppose that the resistance from *b b'* back to X is, let us say, 2,050 ohms. The resistance of the wires C C' is known to be 50 ohms, which of course is deducted. Now, it is plain that from the terminals *b b'* to the spot X must be as 2,000 is to 500 ohms. It then has become certain that the spot X must be one-fifth of the distance between the points *a a'* and *b b'*. Supposing that our cable is 4,000 feet long, this would indicate that X was located about 800 feet from the ends *a a'*. Of course the ends *a a'* and *b b'* should be left open when making these tests. Then the only thing to do is to go out 800 feet from the end of the cable and search for the trouble either by careful inspection of the lead sheath or by cutting and removing the faulty section.

Another means used in taking these measurements is known as the static test, in which the capacity from *a* to X is measured with an astatic galvanometer and standard condensers. This will indicate the distance in much the same way altho hardly practicable for short cables.

The wire chief who makes these tests is of course (or at least should be) supposed to be familiar with these methods.

Buy some good books on testing.

---

A NEW SUBSCRIBER.

42. I have a 'phone in my residence which has been in operation for one year; but my

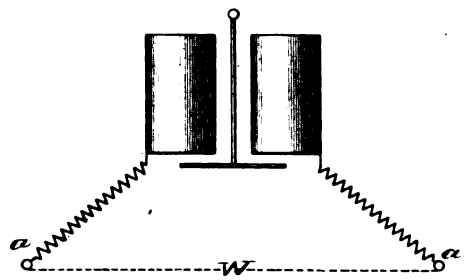



FIG. 3.

'phone has got so it will not ring and I can not ring any one on the line and they can not ring me, but if I can catch any one on the line can talk same as if the bell was all right. Battery seems to be all right.

Our friend is a new subscriber and we are glad to welcome him into our circle. The simple fact that his line can talk all

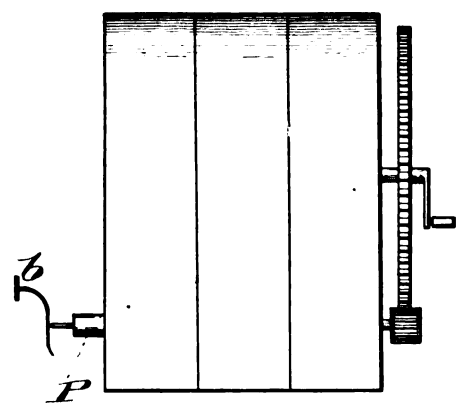



FIG. 4.

right goes far to prove that the trouble is either in the ringer or in the generator circuit, which, of course, is cut out when the hook comes up. To find out whether it is in the bells let him connect a piece of wire W across the terminals *a a'* and

Digitized by Google

ring his generator (Fig. 3). If he succeeds in ringing the exchange that would prove that the trouble is in the bell circuit only, and that, therefore, the ringer magnets need looking after, where he may find a broken wire, which is the most probable cause of the trouble. If, however, he can not get the exchange, open the line, then place the thumb on the spring *b* at the end of the generator shaft (Fig. 4) and one finger on the generator frame. If he can feel the current this indicates that the generator is all right. If not, then look for trouble in the armature of the generator. It may be that the pin P or that the rubber bushings surrounding the pin P have become defective, allowing it to come in contact with the shaft, in which case, of course, there will be a short circuit around the armature.

In the future do not mention the battery in speaking of troubles in your ringer circuit or, like the girl who went to the picnic with dust on her back, you will get yourself laughed at.

---

THAT MILLION DOLLAR OFFER.

43. Are there any lines in this or any other country on which duplex or multiplex telephone systems are used? If so, where? What are some of the more common troubles in such systems?

The Inspector has put this question to some of the best posted telephone men he knows and no one seems to know where any such lines are in operation, and from the fact that President Glidden, of the Erie Company, not long ago offered one million dollars for a successful duplex or quadruplex system and nobody has yet won the million dollars, we take it for granted that such systems are not very successful in practice.

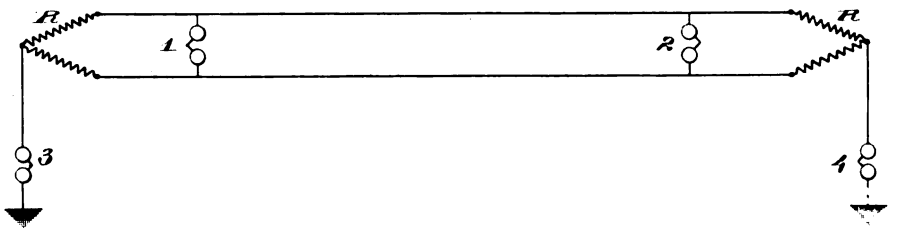



FIG. 5.

The more common troubles in such systems would naturally be cross-talk, owing to the extremely small amount of current required to operate the receiver, and which would escape from one instrument to another and which is one of the troubles of telegraph "quads."

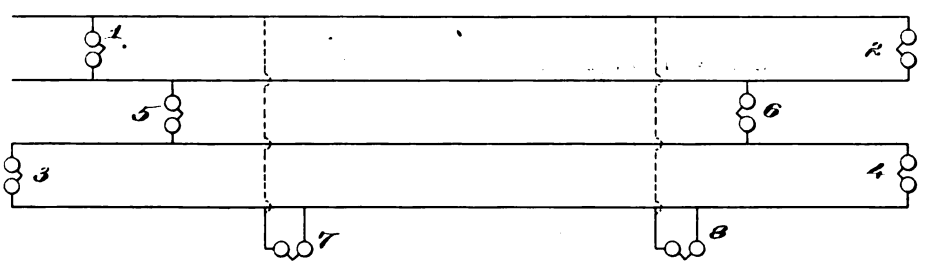



FIG. 6.

One way in which duplexing has been sometimes attempted, and probably as successfully as any other method, is in the plan shown in Figs. 5 and 6.

In Fig. 5 is shown, first, a metallic circuit to which bells 1 and 2 are connected. These two are then joined together thru a resistance coil, say 1,000 ohms; a 1,000-ohm ringer magnet, tapped in the middle, giving 500 ohms on each side would answer. As the two

Digitized by Google

sides of this resistance coil oppose each other, the self-induction, of course, is comparatively small in amount. To these are then connected the bells 3 and 4, which are grounded. This scheme has been fairly successful in practice. Its advantage is in giving selective signaling without unbalancing or grounding the line except thru the high resistance.

Another scheme somewhat similar is shown in Fig. 6, in which telephones 1, 2, 3 and 4 are connected to metallic circuits in the usual way. These two lines are then connected by two other 'phones, 5 and 6, which are legged between the two complete circuits, making practically a third metallic circuit of these two.

This might even be extended so as to include two more, 7 and 8.

While this scheme would give selective signaling, yet there would be cross-talk leaking thru the ringer magnets.

---

44. Should the fuses on the cross-connecting board be mounted on rubber or porcelain?

Porcelain is non-combustible and, therefore, the safest.

---

45. What make of 'phones would you advise us to get?

Those of our advertisers.

---

46. Is there any transmitter as good as the Bell solid back? If so, whose?

The Inspector knows of two or three and thinks a great deal of the one you have. It should not be forgotten that instruments for long-distance work and local work should not be built in quite the same way. ——

COMMON RETURN.

It really seems that there are many of our friends who either can not understand it or can not procure the proper instruments toward making it successful, and here comes another troubled manager who wants to know if it is necessary to run copper wire to the subscribers' instruments, tho he uses iron at present.

Let us look at diagram No. 7, which shows two lines joined to a common-return wire. When instrument No. 2 is rung in most of the current goes over his own line and the return wire, but some of it also goes over line No. 1 thru the bells and drop; but these bells and drop in this case, being of high resistance, allow but a very small portion to pass, as the common return would have a resistance to the office of perhaps 4 ohms as against 1,000 ohms to the line or $\frac{1}{250}$ part of the current.

Should, however, the secondary coil be wound to low resistance and No. 1

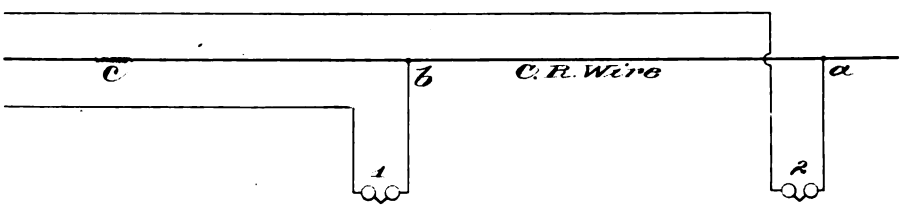



FIG. 7.

and No. 2 both be talking at once, the proportion of current passing between the lines would be greater and might take even .1 of the current, which, of course, would make cross-talk.

Now, it will be seen that the poor joints at *a* and *b* can not possibly produce cross-talk; they would rather tend to reduce it. If, however, there should be a poor joint in the common-return wire at *c*, then the resistance at this point would force a larger proportion of the current to leave the return wire where it belongs and go to the office over the other fellow's line wire, which, of course, would make interference.

One thing must not be forgotten, and that is, that long cables — especially rubber-covered conductors and leaky lines — will also induce cross-talk.

---

"I can not do without the MAGAZINE at any price." P. F. SHOWALTER.

Digitized by Google

# Telephone Magazine

THE ONLY INDEPENDENT TELEPHONE PAPER IN THE WORLD.

MARQUETTE BUILDING,
TEL. CENTRAL 2541. CHICAGO.

Published on the 15th day of each month.

**Electrical Engineering Publishing Co.**

JOHN C. McMYNN, PRESIDENT.
C. E. KAMMEYER, EDITOR.

**SUBSCRIPTION:**

| | |
|---|---|
| One year, United States and Canada | $1.00 |
| One year, foreign countries | 1.50 |
| Single copies | .10 |



**COPYRIGHT:**

The title and contents of this paper are covered by a general copyright. Permission from publishers must be obtained before any article or table is copied, or any illustration reproduced.


**CHICAGO, JULY 15, 1900.**

IN entering upon the third year of our existence, it may not be amiss to cast a retrospective glance and compare the present number of THE TELEPHONE MAGAZINE with the first of "*Electrical Engineering and Telephone Magazine*," published August, 1898. The conditions then necessary to the success of an independent telephone paper, while favorable, were not of the brightest, and it was with some doubt and misgivings that the first number was printed and distributed. The seven representative manufacturers and supply houses, who, having faith in the future of the independent movement and of an independent telephone paper, gave us the first advertising contract, are with us today in company with over fifty additional telephone manufacturers, construction and supply dealers and miscellaneous advertisers. We extend our sincerest thanks to all who have so generously contributed to the success of the independent TELEPHONE MAGAZINE.

## A TELEPHONE TRUST.

According to the Eastern correspondent of the Chicago *Tribune*, the incorporation in Trenton, New Jersey, on the 10th inst., of the National Telephone & Telegraph Company, with a capital of $50,000,000, means the ultimate formation of a trust of greater magnitude than any heretofore conceived. It is stated that the creation of this company is the initial step toward the consolidation under one management of the Western Union Telegraph Company, the Postal Telegraph & Cable Company, all the Bell telephone companies, the Telephone, Telegraph & Cable Company of America, and the National Telephone & Telegraph Company.

If this deal should be consummated, it would create a monopoly of the telegraph and telephone business more absolute than anything now existing, and the inevitable result would be that the United States Government would step in and assume the control and management of the telephone and telegraph business, as it now has of our postal system.

## KELLOGG SWITCHBOARD & SUPPLY COMPANY.

This well-known company is, we are informed, about to enter upon an aggressive campaign of advertising. Heretofore, its manufacturing facilities have been taken up by some of the larger exchange contracts, such as St. Louis, Cleveland, Baltimore and others, and until recently it has not been considered a competitor in the field of smaller work.

The recent large increases in the company's factory and working force, however, and the additions to the line of apparatus put out by it, part of which was exhibited at the Cleveland convention, has enabled it to enter the field for small as well as large work. This company made its initial bow to the general telephone trade at the Cleveland convention, and the success that it has attained in the line of large work will, no doubt, follow it in obtaining smaller and medium-sized contracts.

The entering of any additional first-class manufacturing concern upon the field of telephone work will, no doubt, raise the standard of perfection attained

Digitized by Google

in independent telephony in general. We wish the Kellogg Company success in this its new department of work.

## THE NEW CENTURY TRANSMITTER.

The Century Telephone Construction Company, Cleveland, has brought out a transmitter which possesses several new and desirable features. It is shown in Fig. 1.

The transmitter is composed of a heavy cast front B, a heavy cast bridge C, a heavy outside cup A, and a metal diaphragm I insulated with a rubber ring J. The carbon electrodes K are incased in metal cups F and are turned to an absolutely true surface. The carbon granules are held in place by two mica rings H H, having between them the felt cushion G. The back electrode

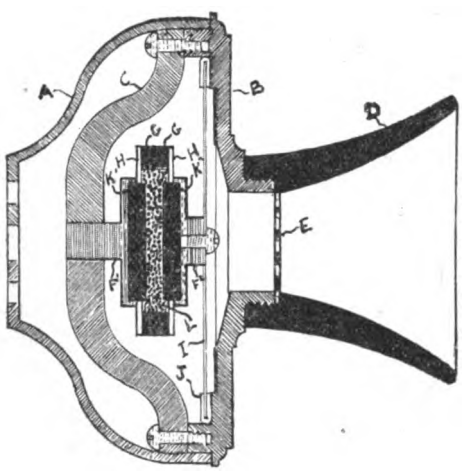



FIG. 1.

is adjusted to the brass bridge C by a set-screw.

The point made in this transmitter is that the carbon granules are allowed to drop below the path of the electrical circuit in going from the front to the back electrode and lie in a pocket formed by the two nonconductor mica rings and felt cushions.

When a transmitter packs it is always at the base of the receptacle for the carbon granules, and is caused by the granules fitting solidly together, or by too much current going thru them and softening and solidifying them. In this form of transmitter the lower portion of the carbon granules is thrown out of the electrical circuit so that any solidifying or packing is done outside of the circuit, and would have no effect whatever upon the working of the transmitter.

The portion of the carbon that lies in the electrical circuit would be free and open and could not pack. The carbon electrodes being parallel there is no more nor no less resistance at one portion than another. By virtue of this arrangement is secured a uniformity of action that is not had in other transmitters. By putting the felt cushion in the center of the transmitter that uncertain resistance is avoided which is apt to be found in transmitters having the felt cushion lying against the diaphragm.

This transmitter is manufactured of very heavy material, and it is claimed will weigh more than any other transmitter on the market. This is claimed to be an important feature, inasmuch as the tendency of transmitters made from stamped material is to warp and get out of adjustment, which must necessarily throw the transmitter proper out of its normal adjustment.

The construction of this transmitter is novel. It is entirely open in the back, and by taking off the outside cup A it is open to an immediate inspection of all its parts. Another important feature of this transmitter is that no metal surfaces are shown on the face of the electrode.

## NEBRASKA ITEMS.

Independent telephony seems to be making rapid strides in Nebraska, judging from the many new exchanges recently put in service. The Lexington exchange was opened in February, 1898, with 45 subscribers, and today has 170 in Lexington, 50 in Cozad, 15 farmers' toll stations, 20 miles individual toll lines connected with long-distance copper-metallic circuits, the Independents having some 275 miles of toll line. S-C apparatus is used thruout, and displacing all other makes. Exchange construction is done with 7 and 8 inch top, 30, 35 and 40 feet poles, all painted and butts thoroly creosoted. All is giving most excellent satisfaction. Lexington has 1,500 inhabitants, Cozad 800, and

Digitized by Google

both exchanges are owned by Mr. George Zimmerer.

Gothenburg, with 900 people, has independent exchange of 75 subscribers at present. S-C 'phones are used. North Platte has 2,000 inhabitants, 110 subscribers, beginning to use S-C 'phones.

At Kearney, Nebraska, a city of 8,000 inhabitants, the Home Telephone Company, with 225 subscribers, is now buying S-C telephones, the Bell exchange puttering away with some 160 misguided adherents.

## AMERICAN ENTERPRISE AT PARIS.

Among the striking and original exhibits at the Paris Exposition of 1900 few have occasioned more favorable comment than the great map of the United States, 15 by 18 feet, exhibited by the well-known advertising agency of Lord & Thomas, Chicago and New York. This map is constructed to show at a glance the various details concerning State areas and population, number of publications in each, circulation per issue, percentage of circulation to population, value of publishing plants, number of employes, average hours of labor, average wages paid and average cost per inch for yearly advertising. Information of this nature is of especial value to advertisers, showing as it does the best locations in which to place advertising to reach the greatest number of people and secure best results.

The firm of Lord & Thomas has been engaged in the general advertising business for over thirty years, and ranks among the largest in its line. They prepare advertisements for all classes of advertisers and place them in any publication in the world.

Copies of this valuable map will be sent free on request to all advertisers who address Lord & Thomas, Trude Building, Chicago.

NEWPORT NEWS, VA.—The Newport News & Richmond Telephone & Telegraph Company has been incorporated to operate a telephone and telegraph exchange. The capital stock is $25,000, and the incorporators are R. P. Orr, W. J. Nelms, N. C. Watts and others.

## SOME NEW AMERICAN EXCHANGES.

American Electric Telephone Company, Chicago, has recently installed some very fine Independent exchanges, in some cases the new company changing from the Bell to the American.

In Morocco, Indiana, J. C. Dixon, proprietor and manager of the Independent Telephone Exchange at this point, after several months' experience as a sub-licensee of the Central Union (Bell) Company has thrown out all Bell apparatus and equipped his exchange with American Electric Telephone Company's apparatus, including a 100-metallic line express switchboard.

Perham (Minn.) Telephone Company has installed American Electric Telephone Company's apparatus. In St. Joseph, Missouri, the Citizens' Telephone Company will soon have in operation a new 1,000-American metallic line multiple board with an ultimate capacity of 3,000.

The Citizens' Telephone Company, of Pennville, Indiana, has contracted for American apparatus, while at Canal Dover, Ohio, a new central energy switchboard from the American Electric Telephone Company has just been placed.

In Brook, Indiana, a change has been made in the exchange apparatus, American goods having displaced the old Bell Company, and the "Central" is much improved by the change.

Lansing, Michigan, has arranged to discard the old style Western switchboards and install the new American flashlight transfer express board of 1,000-metallic line capacity. Contracts have been made.

The finest central office apparatus in Michigan is, undoubtedly, in Muskegon, where a 1,000-metallic line new multiple American switchboard has just been installed.

In Allentown, Pennsylvania, the Lehigh Telephone Company's central office is now being equipped with the latest improved multiple switchboard, made by American Electric Telephone Company, with 1,000-metallic lines installed and an ultimate capacity of 3,000, making this one of the largest and best-equipped exchanges in the State.

Digitized by Google

## RECENT PUBLICATIONS.

"In the type-case of the printer, all the wisdom of the world is contained, which has been or ever can be discovered. It is only requisite to know how the letters are to be arranged. So, also, in the hundreds of books and pamphlets which are every year published about ether, the structure of atoms, the theory of perception, as well as on the nature of the asthenic fever and carcinoma, all the most refined shades of possible hypotheses are exhausted, and among these there must necessarily be many fragments of the correct theory. But who knows how to find them?

"I insist upon this in order to make clear to you that all this literature, of untried and unconfirmed hypotheses, has no value in the progress of science. On the contrary, the few sound ideas which they may contain are concealed by the rubbish of the rest; and one who wants to publish something really new — FACTS — sees himself open to the danger of countless claims of priority, unless he is prepared to waste time and power in reading beforehand a quantity of absolutely useless books, and to destroy his readers' patience by a multitude of useless quotations."—HELMHOLTZ.

DIE MODERNE CHEMIE: EINE SCHILDERUNG DER CHEMISCHEN GROSSINDUSTRIE. Von Dr. Wilhelm Bersch. A. Hartleben's Verlag. Wien, Pest & Leipsic. 800 pps., 7 by 10. Paper, uncut. Price, 9 fl = 15 mark.

This is the third great popular work issued by the firm of Hartleben descriptive of the progress in modern industries. The first, entitled "Mit Schlaegel und Eisen," described and illustrated the mining and allied industries. The second one, "In Reiche der Cyclopen," followed the iron from the ore thru all the stages of its manufacture into bridges, vessels, firearms, armament, etc. The third one, now before us, promises to be the most interesting on account of its purpose to familiarize the reader with the processes by which hundreds of articles essential to modern life are created by chemistry, a branch of science which only recently has gained such a great commercial value.

The work is written for the layman, and, therefore, can dispense with the chemical symbols, which mean so much to the chemist. Pictures and words instead convey to the reader how chemical products are manufactured, giving due consideration also to the laws of nature upon which these chemical processes are based.

The author presents the history of chemistry in the introduction, and then chooses, as his first subject, phosphorus and its application. The method of treatment of each subject is identical. First, its history is given, then its chemical title, so to speak, and, finally, its manufacture by means of modern machinery. Whenever its use is not common enough, or, tho common, not easily recognized, a few remarks are added as to its application. Of course, phosphorus has found unlimited use in the manufacture of matches, and, therefore, this subject forms the main part of the chapter.

Instead of heading the next chapter, "Sulphur and Its Application," the author selected the title, "Explosives," in the composition of which sulphur is the principal ingredient. Gunpowder, gun-cotton, dynamite and other explosives are well discussed, and the chapter ends with a short description of the manufacture of fireworks.

Following association of ideas, the next chapter is devoted to light and heat materials. The candle of not so very long ago has held its own for some purposes, but petroleum superseded it after the discovery of the Pennsylvania and Caucasian oil fields. The manufacture of gas has been another step forward, and today the electric light is in its ascendency. Much general information will be found about the production of petroleum and gas and their by-products; even the manufacture of acetylene is described. The electric light is necessarily omitted, belonging to the domain of engineering, while the Welsbach light has found due recognition.

It would lead too far to go into every detail of the chemical industry. The production of acids and salts on a large scale; of soda, glass, pottery, bricks, sugar, starch; of alcohol, beer, wine and vinegar; the use of oils and fats in the manufacture of soap, candles, perfumes, lacquer, varnish, etc.; the chemical treatment of wood fiber, the benefits derived from coal tar; the gas industry; the manufacture of paints and the dyeing process form the kaleidoscopic contents of this work. Even the chemical technology of food stuffs has not escaped the author's pen.

There is no field of modern science which so directly meets us in many ways. The bread we eat is "manufactured" on a large scale, and thus becomes a product of chemistry; so is butter, certainly the artificial butter — oleomargarine, which, judging from the author's description, is not such a bad article, certainly not so far as cleanliness of preparation is concerned. The time may come when the chemist will supply our daily meats in the form of pellets and tablets.

Whoever takes an interest in his surround-

Digitized by Google

ings and the many objects that form a source of profit and pleasure, and wishes to learn about their origin and existence, will find not only the necessary information in this work, but will discover that the information is given in a charming form and the purely technical description enlivened by episodes that render the reading a source of enjoyment to man and woman, to old and young.

THE STRENGTH OF MATERIALS. By J. A. Ewing. Cloth, 246 pages, 6 by 9; price, $3. Cambridge: At the University Press. New York: The Macmillan Company. 1899.

Taking as a nucleus his article, "Strength of Materials," in the Encyclopædia Britannica, Professor Ewing now gives us a tolerably complete treatise on this interesting and important subject. Recognizing the threefold character of the knowledge which one, rightly to use it, must possess, the author in the present work attempts a lecture-room treatment of the theory, leaving the experimental and practical sides of the subject to be acquired elsewhere.

"Stress and Strain" forms a suitable introduction to this study, and clearly and plainly the author establishes the relations between these qualities and the various elastic constants with which we have to do in the design of structures, and in the testing of materials. In the chapter on the latter subject are shown the principal types of machines designed for tensile, compressive and cross-breaking tests, including the usual schemes for determining the elasticity of materials, several forms of the author's well-known "extensometer" being illustrated.

The two chapters on "Stresses in Beams" and "Deflection of Beams" are elegantly handled, analytical and graphical methods both being used, thus furnishing the student with a double means of attack as well as assisting him to master the principles which he must keep ever before him if he would be a skilful and resourceful designer. The substance of Graphical Status is given in the succeeding chapter on "Frames." Many types of roof and bridge trusses are worked out by way of illustration. The treatment of struts and columns follows the customary transition from Euler's theory thru Gordon's and Rankine's modifications to the more modern formulas used in past design. Under "Torsion of Shafts" the discussion of spiral springs and whirling of shafts is worthy of note, as is also the consideration of the stress in a revolving disk. The suspension bridge and the arch are discussed in a few pages in about as satisfactory a manner as is possible in devoting so little space to such important topics. The author's style is so good and his mathematics so readable that one wishes that he had written more instead of stopping where he has. It is to be regretted that in his treatment of the "catenary" the author does not confine himself to the experimental form of the equation, as most men using such a book as the one before us are not familiar with the hyperbolic expressions, altho, of course, the latter lend themselves very beautifully to the solution of the problem of the hanging chain.

An appendix contains much information pertaining to the strength and elasticity of the usual materials of construction. We venture to suggest that they would be more convenient to Americans if the values were expressed in pounds instead of tons to the square inch.

WIRELESS TELEGRAPHY AND HERTZIAN WAVES. By S. R. Bottone. Cloth, 116 pages, 5 by 7 inches, illustrated. Whittaker & Co. New York: The Macmillan Company, 66 Fifth avenue, 1900. Price, $1.

"Wireless Telegraphy" is the title of an interesting little book by a well-known writer on electrical subjects — a pleasing little book, so written as easily to be read by the general reading public. Four chapters cover the work's extent and carry the inquisitive mind from the simplest notions of electrical phenomena to the latest developments in the field opened up ten or more years ago by the immortal Hertz. The historical sketch of what has been accomplished during this interval, tho brief, fully prepares one for the more detailed description of the memorable experimental results achieved by those who have worked in this field. From Hertz to Marconi is not a long stride, but many advances toward the practical utilization of the principles enunciated by the earlier investigators have been realized, and we are prepared to expect still greater returns from those who are giving their time to this engrossing theme.

The last half of the book before us is devoted to "Constructional Details," and furnishes to those who wish to experiment on wireless telegraphy full directions as to the manufacture of the proper apparatus — from induction coil to coherer.

The typography of the book is good, but many of the illustrations are poor.

Digitized by Google

# INDEPENDENT ITEMS.

BRENHAM, TEXAS.— The charter of the Brenham and Brazos Valley Telephone Company, of Brenham, has been filed with the Secretary of State. The capital stock is $2,000.

PULTNEY, N. Y.—The New York and Pennsylvania Telephone & Telegraph Company will install an exchange in this place on its new rural exchange plan. The local exchange will be owned by the subscribers.

MELLOTT, IND.— The Mellott Telephone Company has been incorporated to operate telephone lines. The capital stock is $2,500; the incorporators are C. Archer, S. A. Moore, H. E. Carpenter and others.

SNICKERSVILLE, VA.— The Snickersville Telephone Company has been incorporated to operate a telephone system and exchange. The capital stock is $5,000, and E. Hawley, C. B. Turner and others are the incorporators.

CHICAGO, ILL.— Kraft Combination Telephone Company has been incorporated to operate a telephone exchange. The capital stock is $375,000. C. H. Kraft, W. L. Rohrer, I. M. Hamilton — all of Chicago — are the incorporators.

WAUSAU, WIS. — The Marathon County Telephone Company has been organized, and will at once begin to build lines thruout the county. The following board of directors was elected: W. F. Ladu, of Mosina, A. W. Punchner, of Athens, K. W. Dodge and others.

ROMNEY, W. VA.— A charter has been issued to the Romney Telephone Company. The company is formed for the purpose of constructing and operating a telephone line from Romney to Rio, via Rock Oak, John Riggleman's, Fairview Church and several other points, with branch lines extending from Kirkby to intersect the main line. The incorporators are J. Shawholtzer, of Stony, R. S. Davis, D. G. Holt and others.

ATTICA, OHIO.— The Attica Telephone Company, capitalized at $25,000, has been incorporated by H. C. Blaine, E. G. Blaine, F. C. Myers and a number of others.

CAMDEN, TENN.— The Dixie Telephone Company has been incorporated to operate a telephone line, by R. G. Hudson, W. T. Hobbs and N. A. Rolls, with a capital stock of $1,500.

KENT, OHIO.— The Kent Telephone Company, of Kent, Portage County, was incorporated by M. Kent, D. J. Getz, W. H. Butler and several others. The capital stock is $50,000.

COLDWATER, OHIO.— The Coöperative Telephone Company, of Coldwater, Mercer County, has been incorporated by C. F. Morrisius, J. B. Haslinger and others, and has a capital stock of $2,000.

NORTH SALEM, N. Y.— The North Salem Telephone Company has been incorporated, with a capital stock of $500. The directors are H. Hobart Keeler, E. C. Bacon, A. Howe and D. P. Vail.

BENTON, TENN.— The Secretary of State has granted a charter to the Benton County Telephone Company, with $2,000 capital stock. The incorporators are G. W. Baker, W. A. Weldon and S. A. Bullock.

ROMNEY, W. VA.—J. L. Shawholtzer, of Stony, West Virginia, and others, have incorporated the Rio Grande Telephone Company, for construction of a system from Rio Mists, Virginia, to Romney, West Virginia. The capital stock is $2,000.

WAUSAU, WIS. — The Marathon County Telephone Company has been incorporated and a meeting was held in the city June 11 to elect a board of directors and discuss plans. The capital stock is $10,000. It is proposed to begin the work of construction by July 1. In a little while the Little Wolf River Telephone Company's lines will be connected with the new system.

Digitized by Google

ROCKWOOD, TENN.—A new telephone exchange is being put in at this place.

GREENSBURG, IND. — The Decatur County Telephone Company, of Greensburg, has been incorporated to operate telephone lines. The capital stock is $30,000, and the incorporators are J. Shanks, M. Spilman and others.

TABOR, IOWA.— The City Telephone Company has been incorporated to operate a telephone exchange. The capital stock is $12,000, and the incorporators are S. Lindsay, M. T. Davis, J. C. Rhode and others, all of Tabor.

BOONE, IOWA.—The Boone County Telephone Company, of this city, has been incorporated to operate a telephone exchange. The capital stock is $100,000, and the incorporators are G. I. Miller and C. C. Dehring, of Boone.

WEBSTER CITY, IOWA.— The Chamberlain Independent Telephone Company has been incorporated to operate a telephone exchange. The capital stock is $20,000, and the incorporators are A. W. Chamberlain, A. G. Bremer and others, all of Webster City.

MENDEN CENTRE, N. Y.— The Menden Telephone Company has been incorporated to operate in Menden Centre, Rochester Junction and Moneoye Falls, Monroe County. The capital stock is $6,000, and the directors are E. H. White, B. H. Cole, A. A. Lord and others.

STAUNTON, VA.— The scheme for a long-distance telephone system to ramify Virginia is no longer problematic, but an established fact, a charter having been granted to the new company. J. R. Kemper, of Fisherville, is the president, W. H. Laughlin, of Staunton, is secretary and treasurer. The capital stock of the company is $100,000.

SUMMERVILLE, VA. — The Gauley Bridge, Summerville and Camden Telephone Company was incorporated here recently for the purpose of constructing and maintaining a telephone line from Gauley Bridge to Camden-on-Gauley, and from this main line to Kessler, Cross Lane, and a number of other places. The company is to have its principal office at Summerville. Its subscribed capital stock is $1,600, of which ten per cent is paid up, the privilege being reserved to increase to $25,000. Among the incorporators are J. C. Dunbar, J. M. Hutchinson and others.

CUERO, TEXAS. — The Cuero and Sasseville Telephone Company has been incorporated by J. Hunter, W. Breeder and Mrs. D. S. Weldon. The capital stock is $600.

WORCESTER, MASS.— The Citizens' Telephone & Telegraph Company of Worcester has been incorporated, with a capital stock of $300,000, by H. S. Pratt, president; A. B. R. Sprague and others.

FARINA, ILL.— Farina and Vandalia Telephone Company has been incorporated, with a capital stock of $2,500, to operate a telephone line. The incorporators are T. Zinn, C. T. Wade and others.

WICHITA FALLS, TEXAS. — The Wichita Telephone Company has been incorporated here, with a capital stock of $10,000. The incorporators are R. E. Huff, A. Kemp, J. M. Belt and others, all of Wichita Falls.

HEDRICK, IOWA.— The Hedrick Telephone Company has filed articles of incorporation, and has been granted a charter. It has a capital stock of $2,000. The directors are J. T. Brooks, A. M. Utterback and others.

WILLS POINT, TEXAS.— The Excelsior Telephone Company has been incorporated, with a capital stock of $6,000, to construct and operate telephone lines, by J. E. Owens, W. V. Wilson and W. R. Howell.

HAMIER, OHIO.— The Hamier Telephone Company has been incorporated, to construct and operate a telephone system. The capital stock is $10,000, and the incorporators are F. D. Quintis, W. S. Barhite, A. M. Jackson and others.

PLAINFIELD, N. J.— The Plainfield Telephone Company, principal office 76 Montgomery street, Jersey City, has been incorporated. The capital stock is $15,000, and the incorporators are A. Dengler, R. A. Amory and H. F. Atkinson.

Digitized by Google

# MONTHLY DIGEST OF TELEPHONE AND KINDRED PATENTS

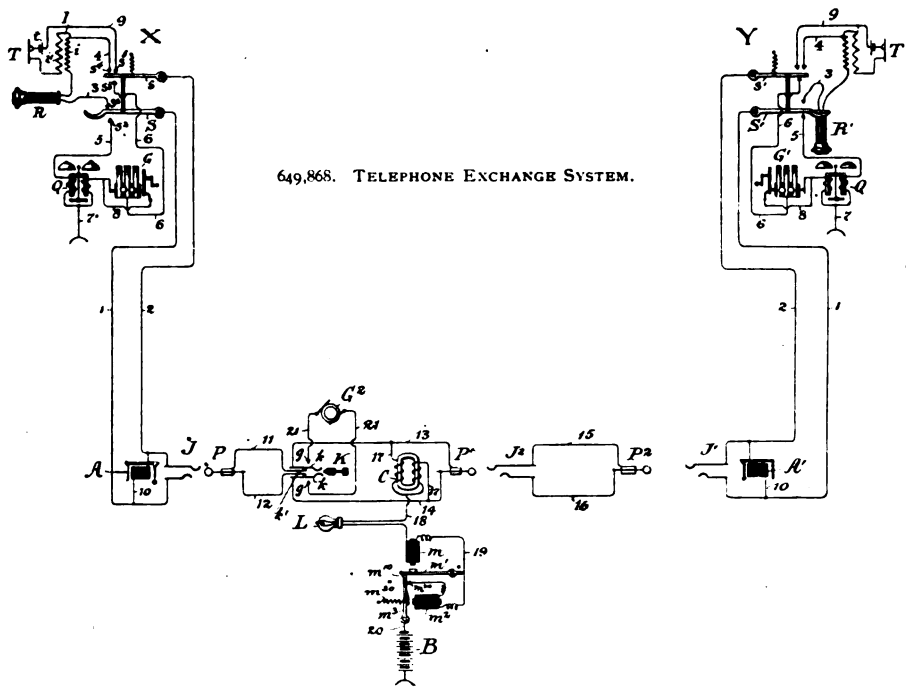
EDITED BY EDWARD E. CLEMENT.

Copies may be had, postage paid, by enclosing 10 cents for each one. Address inquiries in care of this magazine or to McGill building, Washington, D. C.

*May 15—Continued.*

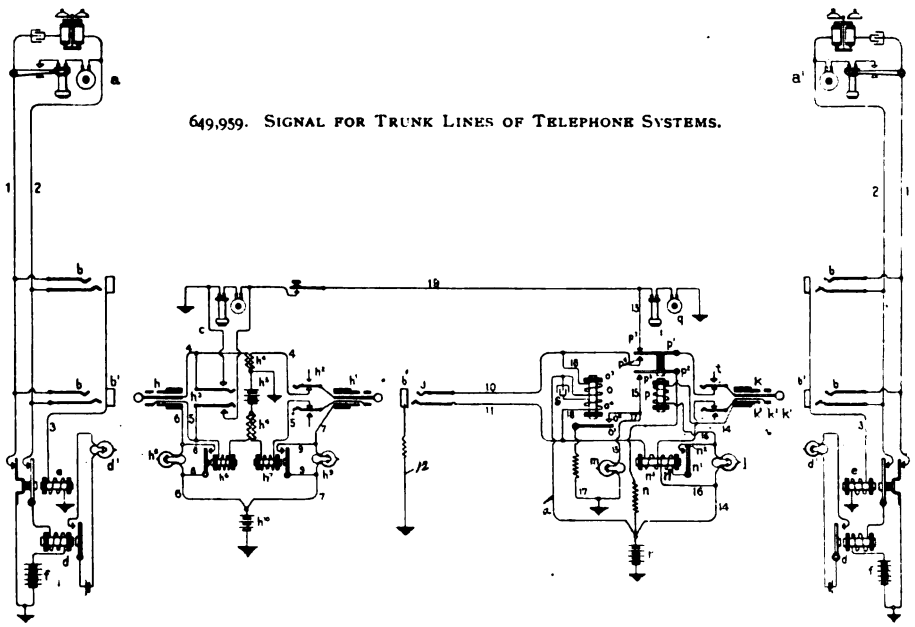
No. 649,868.—W. D. GHARKEY. TELEPHONE EXCHANGE SYSTEM.

This invention relates to systems wherein trunk lines are employed and the responsibility for each connection is placed upon the answering operator, who supervises every step thereof. For this purpose certain ground connections are employed, but as grounds upon telephone lines are always objectionable and are liable to cause trouble during conversation, all grounds are removed by the present invention during conversation. X and Y are subscribers' stations, each provided with the usual talking set, generator G and ringer Q. The middle point of the ringer windings is permanently grounded at 7. An annunciator having a coil of high impedance is bridged permanently across each line at the central office as shown at A. Across each cord circuit an impedance coil C is bridged, from the middle point of whose winding a tap 18 leads to the signal L and thence normally thru two magnets $m$ and $m^2$ and a battery B to ground. The magnet $m$ has an armature $m^1$ provided with a hook $m^{10}$ normally holding up the armature $m^3$ of the magnet $m^2$, the circuit thru both magnets leading thru the front contact $m^{20}$ and the armature $m^3$. When subscriber X calls, his annunciator falls and the call is answered in the usual way. When the connection has been trunked thru to the desired line, current immediately passes from battery B thru the magnet $m^2$ and $m$ and the signal L, thru the coil C, thru the wires 13-18, 15-16, 2-1 and 5-6 to and thru the ringer windings Q', all these in parallel, and to ground thru the wire 7. The consequent exhibition of the signal L informs the answering operator that the connection is complete, and she then




Digitized by Google

proceeds to ring by means of the key K. When subscriber Y answers he removes the ground from his line by cutting off the bell Q'. This has the following effect: When current first passed from the battery B, the magnet $m$ attracted its armature $m^1$, which would have released the armature $m^3$, but the latter is held up by the magnet $m^2$. When the ground at station Y is removed, the armature $m^3$ falls back before the armature $m^1$ can again detain it, the latter being made sluggish; and thencefor-



649,959. SIGNAL FOR TRUNK LINES OF TELEPHONE SYSTEMS.

ward all grounds are removed from the lines during the continuance of the connection. The disappearance of the signal L informs the answering operator that subscriber Y has responded.

*May 22, 1900.*

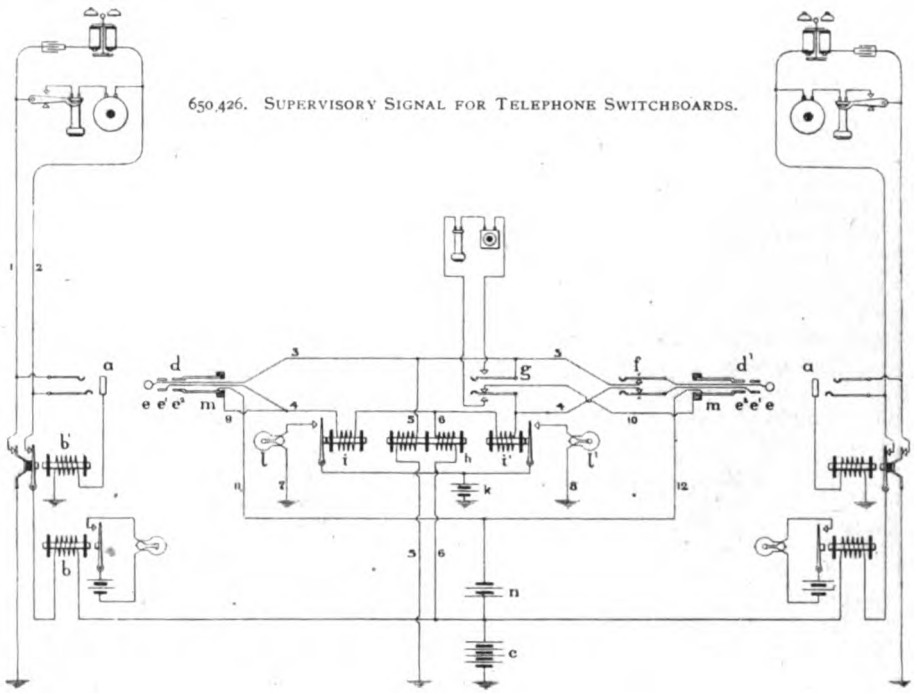
No. 649,959.—C. E. SCRIBNER. SIGNAL FOR TRUNK LINES OF TELEPHONE SYSTEMS.

The invention set forth in this case consists essentially of a supervisory signal similar in all respects to those employed in connecting cord circuits, but with its location changed to the trunk line terminal. $a$ and $b$ are subscribers' stations, $c$ and $d$ are the usual cut-off and line relays respectively, $d'$ the line signal, 4-5 a connecting cord circuit with bridged talking battery $h^5$ grounded on one side, $h^6$ and $h^7$ are relays in the cord circuit excited by current from battery $h^5$ when conversation is proceeding, and controlling shunt circuits 8 and 9 around the supervisory lamp signals $h^8$ and $h^9$. When either of two connected subscribers hangs up his receiver the current flow ceases thru his relay $h^6$ or $h^7$, as the case may be, and the shunt around his lamp signal being thereby broken, it becomes visible. The circuits of the lamps are completed thru battery $h^{10}$, wires 6 and 7 and the jack test rings, thru the cut-off relays to earth. In the case of the trunk jacks, a special ground connection 12 is provided. These two signals $h^8$ and $h^9$ indicate to the answering operator the condition of the lines, but in order to increase the certainty of service, a relay $n$ is placed in the trunk wire 11, before the trunk operator, which, similarly to the relays $h^6$ and $h^7$, is energized by current flowing from battery $h^5$ during conversation and is caused to shunt the supervisory lamp $l$. In the shunt circuit 16, however, a portion $n^4$ of the windings of the relay $n$ is included, so that when once attracted, armature $n'$ remains so, and the lamp can not again

Digitized by Google

light. It indicates to the trunking operator when the subscriber called has answered.

In addition to the above, a trunk clearing-out signal *m* and a magnetically controlled test or listening key $p^1$ $p^2$ is provided. The former is controlled by relay *o* bridged across the trunk, the continuity of its windings being broken by the condenser *s*, from one side of which the tap 19*a* goes to battery *r*.




This same battery supplies the lamp *l* and the cut-off relay of any line to which the trunk plug *k* may be connected, as well as the lamp *m* and the relay *p*, which is in series with the lamp *l*. Supposing *a* to have called for *a'*, the A operator connects jack *b* with trunk jack *j* by cord 4-5, after communicating with the trunk operator over instruction circuit 19, whereby battery *r* sends current thru wire 19 *a*, relay *o*, wires 18, 10 and 4, to ground thru winding $h^4$ of the cord repeating coil. Relay *o* then closes shunt 17 about lamp *m*. The trunk operator then tests jack *b* of line *a'*, her telephone being connected as shown, thru the inactive condition of relay *p*. If the line is idle, the plug *k* is inserted, when current immediately flows from battery *r* thru lamp *l* and relay *p* to wire 3 and cut-off relay *e*. Springs $p^1$ $p^2$ are therefore pulled down, completing the side 10 of the trunk and connecting battery *r* with lamp *m*, while at the same time breaking the test circuit 13 to operator's telephone *i*; this condition continuing as long as plug *k* is in the jack *b*. When plug *h'* is finally removed from the trunk jack, the relay *o* becomes deënergized to break shunt 17 and light lamp *m*.

The function of the bridge 18 with condenser *s* is to produce a static balance in the circuit.

*May 29, 1900.*

No. 650,426.— C. E. SCRIBNER. SUPERVISORY SIGNAL FOR TELEPHONE SWITCHBOARDS.

The line apparatus and cord circuits of this system are of the familiar central energy "relay" type. Relays *i* and *i'* in the cord circuit respond to the movements of subscriber's switchhooks, making or breaking the circuits of supervisory lamps *l* and *l'* with battery *k* as current from battery *c* is permitted to flow thru one line or the other.

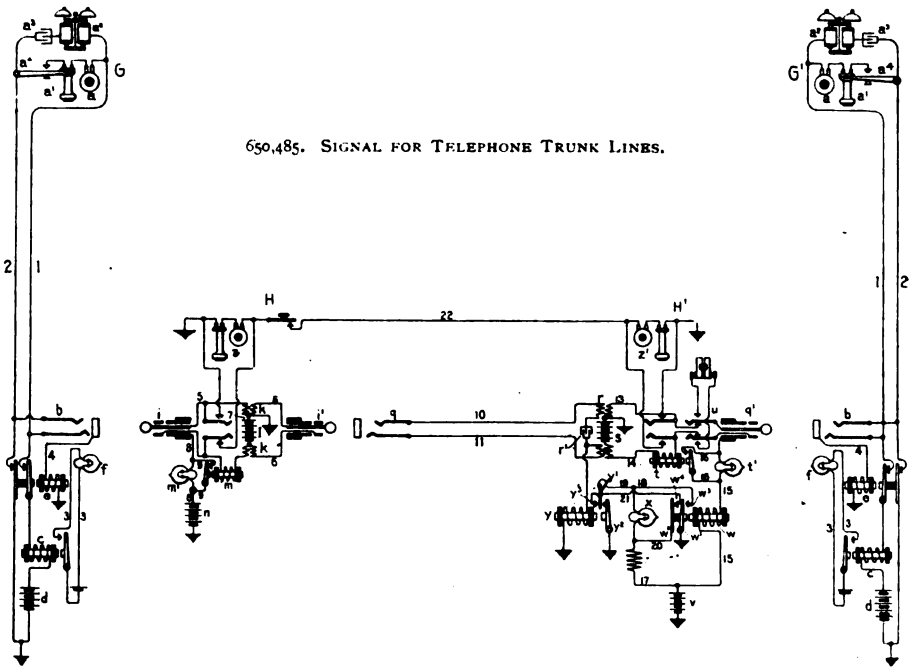
Digitized by Google

As the relays close the lamp circuits when their armatures are released, it is necessary to provide means for holding the latter up when a cord is in disuse, and such means being the plug-seat switches *m m*, which complete the circuits 12-10-*i'*-6 and 11-9-*i*-6 while plugs *d'* and *d* respectively rest in their seats.

No. 650,485.— C. E. SCRIBNER. SIGNAL FOR TELEPHONE TRUNK LINES.

This is another system of the central energy "relay" type, with the usual supervisory signal *m'* and its shunting-relay *m* for the answering plug *i*; with a similar supervisory signal *t'* and its shunting-relay *f* at the B or trunking operator's position; and with a special "guard signal" *x* for the trunk. When plug *i'* is inserted in trunk jack *q*, current from battery *l* flows as follows: Cord conductor 6, trunk wire 11, relay *y* and to earth, and back to battery. This path remains closed and the relay energized as long as the connection continues. The lamp *x* then is lighted from battery *v* by this circuit: Wire 17, lamp *x*, wire 19, spring $y^1$, armature $y^2$ and earth to battery. When in obedience to order over circuit 22 the B operator inserts plug *q'* in jack *b*, relay *w* is energized by current from battery *v* as follows: Wire 15, relay *w*, lamp *f'*, wire 4, cut-off relay *l* and earth to battery. Lamp *f'* lights, relay *w* pulls over springs $w^1$ $w^2$ and lamp *x* is extinguished, a shunt for the latter then being closed thru wire 20, spring $w^2$, wire 21 and armature $y^2$. At the same time another branch to ground from lamp *x* is closed by wire 18 and spring *w'*.

When subscriber G' answers, lamp *t'* is shunted by relay *f* and extinguished.

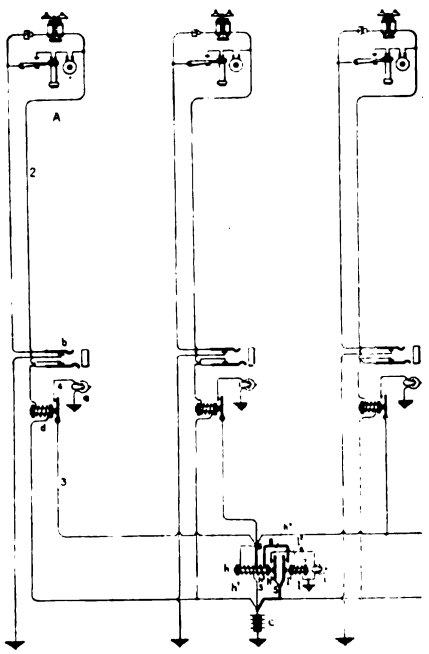



If, now, plug *q'* is taken from the jack *b* before plug *i'* has been withdrawn, lamp *x* lights as a warning, the springs $w^1$ $w^2$ falling back to break the shunt 21; but if plug *i'* is withdrawn first, as it should be, then lamp *x* lights as a disconnecting signal by means of current in wire 18. Then when plug *q'* comes out, in order, circuit 15-4 is broken, springs $w^1$ $w^2$ fall back and lamp *x* is again extinguished.

No. 650,486.— C. E. SCRIBNER. PILOT SIGNAL FOR TELEPHONE SWITCHBOARDS.

In providing a pilot lamp relay for central energy systems, where the relay coils have been in the common return of the line signals, two sets of contacts

Digitized by Google



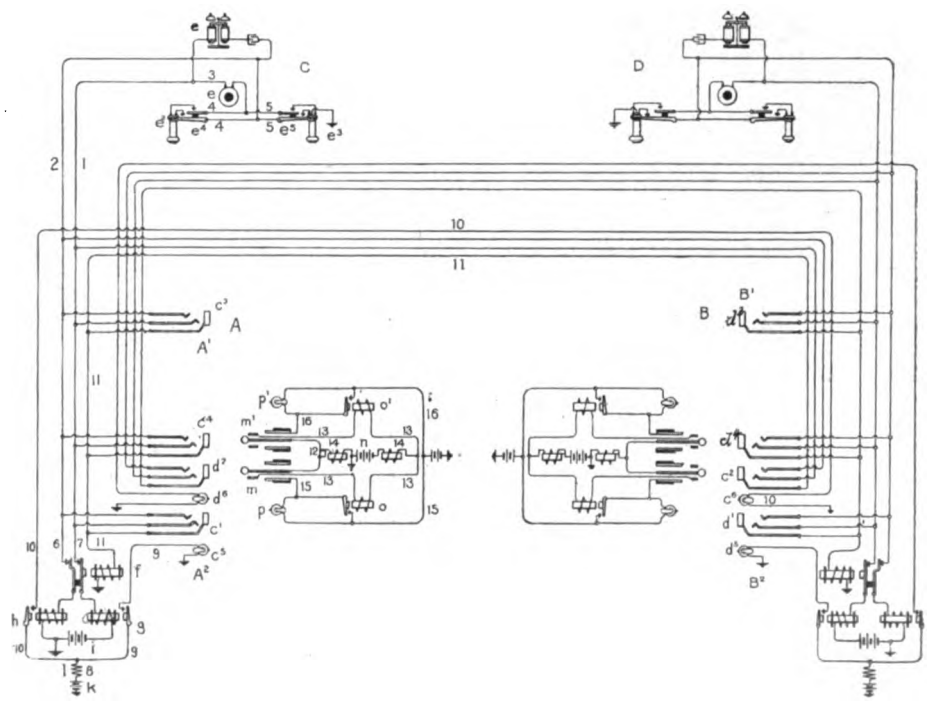
650,486. PILOT SIGNAL.

have been used, controlled by one armature.

The present scheme involves the use of two relays and separate armatures. The high winding $h'$ of relay $h$ gets current when any line relay pulls up through wires 3-4, this current being sufficient to pull up armature $h^3$, but not to light the line lamp. The pilot lamp $i$ then lights, and at the same time relay $l$ in parallel with it pulls over its armature $l^1$ to close the circuit 5-$l^1$-$l^2$-8-coil $h^2$, which permits enough current to flow for the line lamp and also holds up armature $h^3$.

No. 650,487.—C. E. SCRIBNER. CALLING APPLIANCE FOR TELEPHONE SWITCHBOARDS.

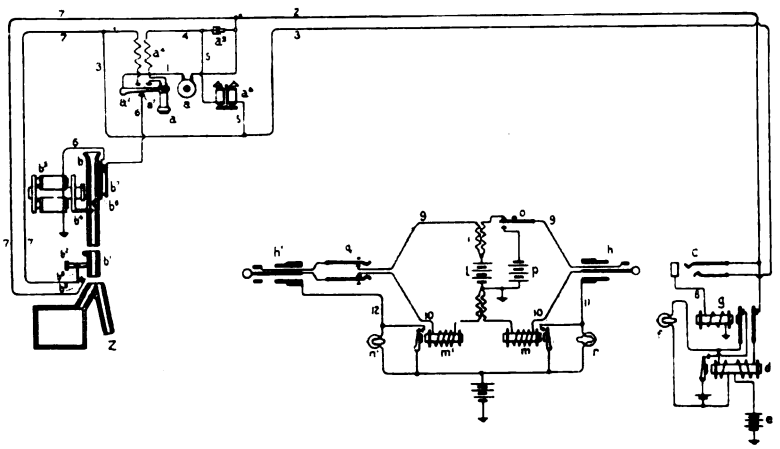
This is a divided multiple switchboard, each subscriber's line having an answering jack and signal at each of two divisions or stations and a multiple jack at every section of one division. Thus line 1-2 has a signal $c^5$ at board A and a signal $c^6$ at board B, an answering jack $c^2$ at the latter board and multiple jacks $c^3$ $c^4$ at board A. Each subscriber has two receivers, on separate hooks,



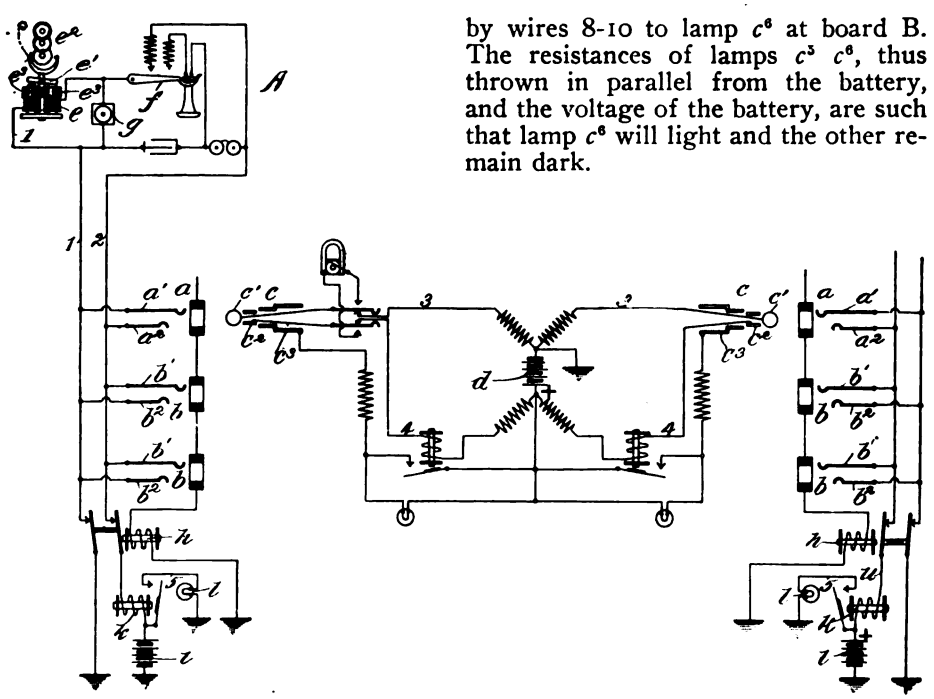
650,487. CALLING APPLIANCE FOR TELEPHONE SWITCHBOARDS.

Digitized by Google

one having a ground tap $e^3$ and the other none. To call board A, subscriber C uses receiver $e^5$, current then flowing from battery *i* thru relay *g* to wire 7, and both relays *g* and *h* get current from the battery *i*, in series. Both relays close their locals from battery *k*, relay *g* as already stated, and relay *h*,



650,488. TOLL COLLECTING APPLIANCE.



650,489. CONNECTION COUNTER FOR TELEPHONE LINES.

by wires 8-10 to lamp $c^6$ at board B. The resistances of lamps $c^5$ $c^6$, thus thrown in parallel from the battery, and the voltage of the battery, are such that lamp $c^6$ will light and the other remain dark.

line wire 1 receiver $e^5$ and ground. Relay *g* thereupon closes circuit *k*-8-9-$c^5$ to ground, and lights lamp $c^5$.

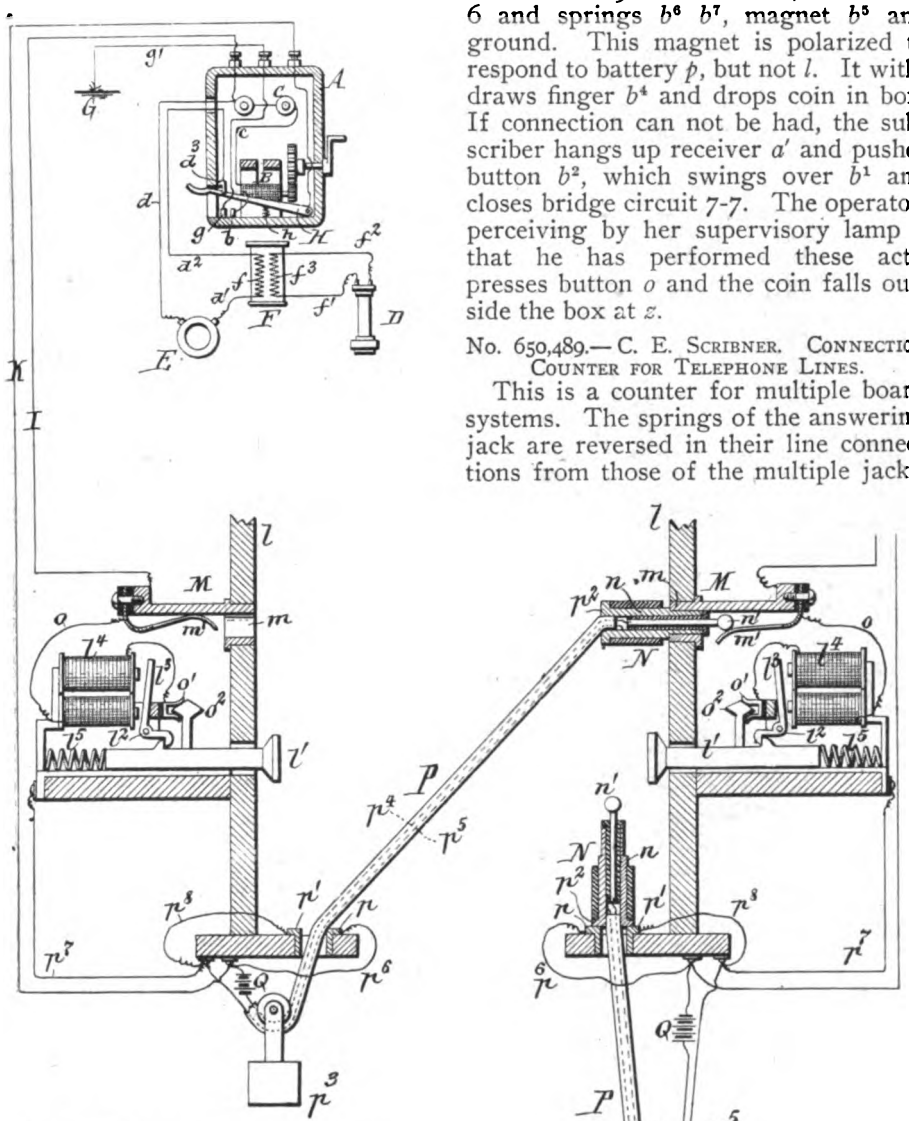
If receiver $e^4$ is used, the metallic circuit is bridged, but no ground is on,

No. 650,488.—C. E. SCRIBNER AND F. R. MCBERTY. TOLL-COLLECTING APPLIANCE FOR TELEPHONE PAY STATIONS.

The subscriber's station on the left in this diagram has a coin chute with a

Digitized by Google

portion $b^1$ pivoted to be moved by a button $b^2$. The rest of the station set, the central relay *d*, signal *f* and cut-off relay *g* are the same as usual in "relay" switchboards, except that relay *d* has a short winding in the local circuit to hold



650,548. TELEPHONE EXCHANGE SYSTEM.

its armature up when once attracted. The cord circuit is also standard, except that a battery *p* and a key *o* are added, the former of opposite polarity to conductor 9 from the regular bridged battery *l*. Subscriber calls by dropping coin at *b*. It lodges on finger $b^4$ and closes $b^6$ $b^7$, calling central. Receiver *a'* is then taken down, and, if desired, connection can be had; operator afterward depresses key *o*, putting battery *p* to line from 9 to line wire 2, to wires 1, 6 and springs $b^6$ $b^7$, magnet $b^5$ and ground. This magnet is polarized to respond to battery *p*, but not *l*. It withdraws finger $b^4$ and drops coin in box. If connection can not be had, the subscriber hangs up receiver *a'* and pushes button $b^2$, which swings over $b^1$ and closes bridge circuit 7-7. The operator, perceiving by her supervisory lamp *n* that he has performed these acts, presses button *o* and the coin falls outside the box at *z*.

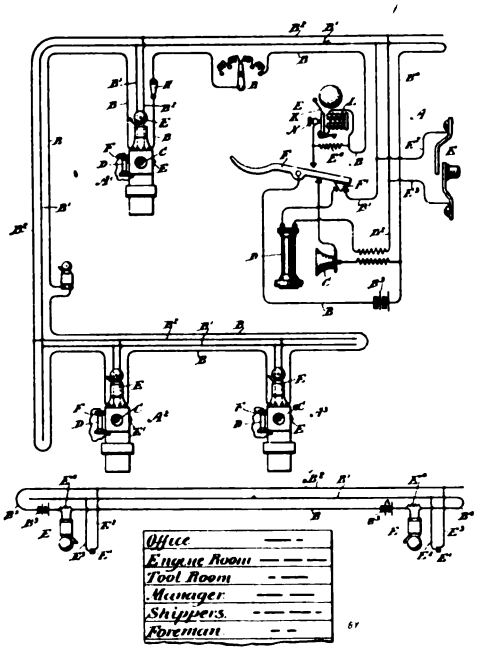
No. 650,489.— C. E. SCRIBNER. CONNECTION COUNTER FOR TELEPHONE LINES.

This is a counter for multiple board systems. The springs of the answering jack are reversed in their line connections from those of the multiple jacks.

Digitized by Google

At the subscriber's station is a register requiring two current impulses of opposite polarity for each operation.

When subscriber calls, current from battery *l* affects register magnet *e* for the first step, and when plug *c* is inserted in answering jack *a*, battery *d* is then connected oppositely, to work the register the necessary second step. In using the multiple jacks for calling no effect is produced, as the currents sent to line are always of the same polarity, and




650,570. SIGNALING SYSTEM.

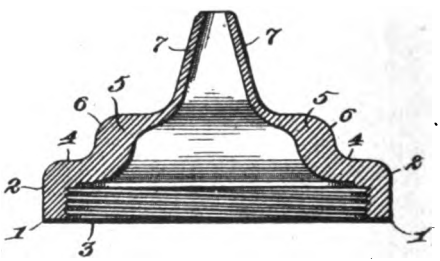
ringing currents do not affect magnet *e* by reason of copper rings $e^1$ $e^3$ or other devices to make the magnet sluggish.

No. 650,548.—W. SMITH. TELEPHONE EXCHANGE SYSTEM.

This is what is known as a single plug switchboard, i. e., one having a terminal plug for each line. Each line also has its battery Q normally on open circuit, the cord, however, being short-circuited in the plug seat by the metal heel resting on contacts *p p'*, this being necessary as the annunciator magnets $l^4$ $l^5$ are in series therewith. After ringing up by the hand generator B, and thereby throwing out plunger $l^1$, the subscriber is connected with the operator by her own plug being inserted in his jack *m*, and afterward by his plug N with the wanted line jack. The line annunciator $l^4$ $l^5$ serves for clearing out.

No. 650,570.—L. C. SMITH. SIGNALING SYSTEM.

This is a factory or house system. Three wires are employed, in series thruout, with push-buttons bridged so that when any button is depressed all the bells ring. A code is then relied on to select the station wanted. The inventor says the code may apply to persons in an establishment rather than the stations, and then any person may be called to the nearest 'phone wherever he may be in the establishment.




32,779. EARPIECE FOR RECEIVERS.

*June 5, 1900.*

No. 32,779.—L. H. COALE. EARPIECE FOR TELEPHONE RECEIVERS.

This is a design for an earpiece or cap for receivers. The distinguishing feature is the nipple 7, which is intended to enter the ear.

No. 650,836.—F. HATMAKER. TELEGRAPH SOUNDER.

This is a sounder of substantially ordinary construction, mounted on the usual base and sounding plate, and provided with a special form of tension spring for the armature. This is marked G in the figure, and is a bowed spring, with one end secured to the under side of the armature lever, and the other perforated to slip over and be adjustably held on the tension screw, being retained thereon by a nut.

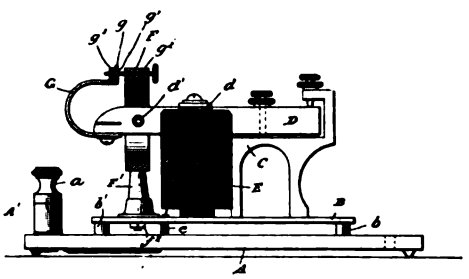
No. 650,915.—C. E. SCRIBNER AND F. R. McBERTY. RELAY FOR TELEPHONE LINES.

This is a sensitive relay, particularly adapted, as may be inferred from the

Digitized by Google

language of the description, to be used in the cord circuit of the well-known "relay systems," for controlling supervisory signals.

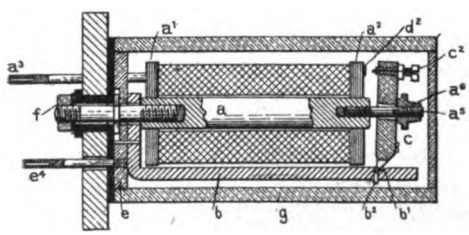
In the figure, *e* is a disk, with screw-threaded edge, carrying a 3-16-inch copper shell *g*, to prevent electromagnetic induction, the shell being closed



650,836. TELEPHONE SOUNDER.

at the other end. The core *a* has rubber or fiber heads, $a^1$ $a^2$, and the projecting bolts $a^5$ and *f*, the former passing thru an opening in armature *c* and serving as a limiting stop therefor, and the latter securing the magnet to disk *e*, and the entire structure to the support. Wire terminals $a^3$ $a^4$ (not shown) and $e^4$ project thru bushed openings.

The armature has an edge on its bottom, which rests in a transverse channel in the backwardly extended pole-piece *b*, being held against side displacement by a pin $b^2$. Front contact $a^2$ is on the end of a strap extending forwardly from head $a^2$ and bent over on

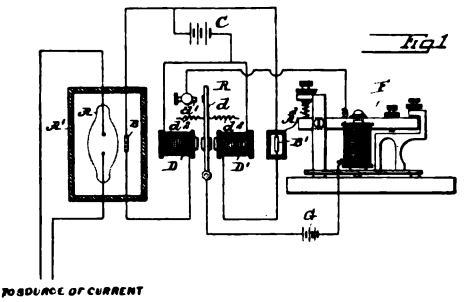


650,915. RELAY FOR TELEPHONE LINES.

the head, to which it is secured. Armature contact $c^2$ is a screw with platinum point. The adjusting nut $a^6$ has a split sleeve, compressed on the screw thread $a^5$, to obviate the necessity for a lock-nut. The entire device can be made of punchings and turnings, making it cheap as well as sensitive.

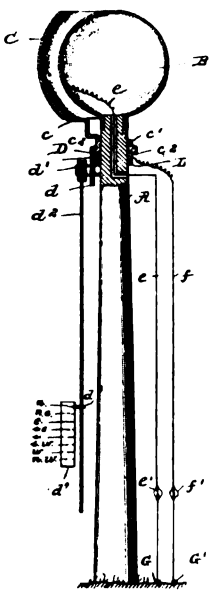
No. 651,013.—I. KITSEE. ELECTRIC TELEGRAPHY.

This is a device intended to translate "glow-rays" in a vacuum tube into audible signals. A is a vacuum tube in




651,031. ELECTRIC TELEGRAPHY.

a dark chamber A', and in the same chamber is a selenium resistance B, included in circuit with a magnet D and battery C. A twin magnet D' is in circuit with a balancing resistance B', and



651,014. SPACE TELEGRAPHY.

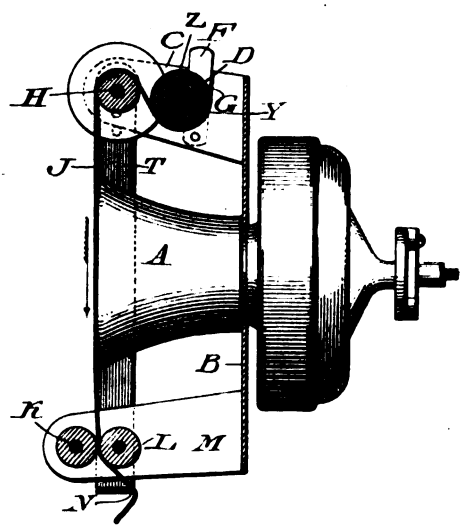
the same battery C supplies this circuit. A glow produced in tube A lowers resistance of selenium resistance B and causes energization of magnet D, to attract armature *d*, which closes circuit of sounder F. When the glow subsides

Digitized by Google

resistance of selenium B again rises and the balance of resistances being restored, magnet *D'* pulls over armature *d* to break the sounder circuit.

No. 651,014.—I. KITSEE AND C. E. WILSON. SPACE TELEGRAPHY.

This is a device for ascertaining the direction from which atmospheric waves are coming to the receiving station. B is a sphere mounted on a post A and partly covered by a rotatable shield C. The shield is shown as rotated by a rack and pinion, worked by a rope over a pulley, the rope carrying an indicating finger *d* which shows on a




651,179. GERM ARRESTER FOR MOUTHPIECES.

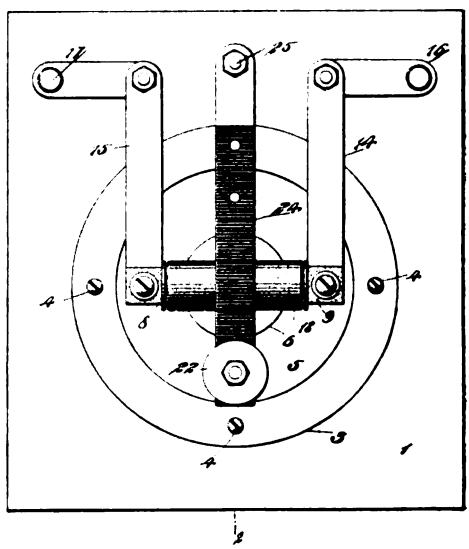
scale the compass point toward which the shield is adjusted. Two instruments are employed — *e'* and *f'* — one connected to the globe and the other to the shield. When the latter, only, responds, it shows that the shield has cut off the waves from tne sphere surface, and the indicator shows the direction the waves must therefore be proceeding from.

No. 651,033.—G. W. GESNER. MANUFACTURE OF ELECTRICAL CONDUCTORS.

This patent really covers the product of Mr. Gesner's process, which is a conductor claimed to be particularly adapted for telephone contacts, dynamo brushes, etc. It is an "alloy" of iron and hydrogen, produced by exposing the iron in a converter at 1800° to an atmosphere of hydrogen, or in some other ways mentioned. The product is said to resist all oxidation or corrosion and to have only one-half the specific gravity of iron.

No. 651,179.—C. J. BRANCH. GERM ARRESTER FOR MOUTHPIECES.

This is a frame carrying a roll of paper D from which the paper is led across the front of the mouthpiece A of the telephone, on which the frame is supported. The user talks thru the




651,198. TELEPHONE TRANSMITTER.

paper, pulling down a fresh piece if desired.

No. 651,198. J. M. MOORE. TELEPHONE TRANSMITTER.

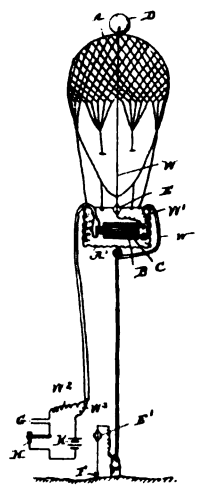
This is a reversion to first principles in a transmitter of the true microphone class. Electrodes 8 and 9, with other twin electrodes, not shown, are suspended by spring bars 14, 15, connected to binding posts 16, 17, and are bridged by a carbon tube or tubes 18, within which carbon balls are provided. The suspending bar 24 carries weight 22, which regulates the pressure of the carbon bridge against diaphragm 5, the latter having an inner line of fibrous or textile material to deaden or damp excessive vibration.

Digitized by Google

*June 12, 1900.*

No. 651,361.— I. KITSEE. ELECTRIC TELEGRAPHY.

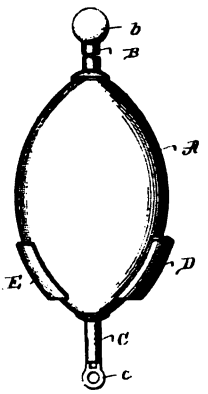
This is an invention designed to improve wireless telegraphy by removing the induction coils from earth influence. The coil B C is carried in the basket of a captive balloon, which also carries the conducting ball D. The circuit of the primary coil B is brought down in a cable and connected to key H, vibrator G and battery K, while the circuit of the secondary coil C is from the ball D thru the vacuum globe E, the coil, to earth thru vacuum globe E'. The inventor proposes also to utilize kites, and shows a box kite with ball D on it.



651,361. ELECTRIC TELEGRAPHY.

No. 651,362.— I. KITSEE. SPACE TELEGRAPHY.

This invention involves the application of wireless telegraphy to buoys, a wave transmitter being located on each buoy, so that passing vessels, even in a fog or storm, may receive the signals and know their whereabouts. The inventor provides plates D and E of carbon and zinc respectively, on the outside of the buoy, which upon their immersion in salt water develop a difference of potential of 1½ volts, and these plates he connects in circuit with a number wheel like that in a fire-alarm box, and the primary of a suitable induction coil, both inside the buoy. The number wheel is driven constantly by clockwork or otherwise. The secondary coil is connected from the water, outside, up a mast B to the radiator *b*, from which the waves are disseminated in all direc-

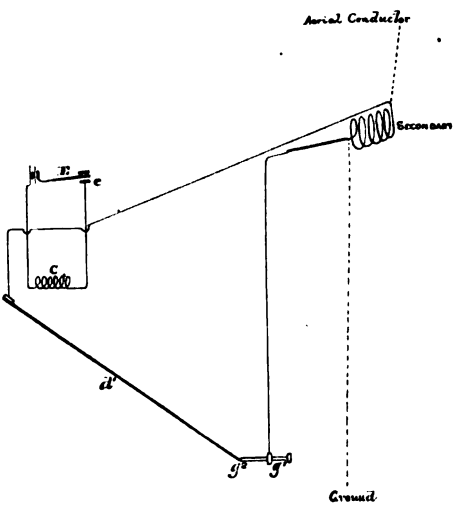



651,362. SPACE TELEGRAPHY.

tions, to affect the receiving instruments on vessels.

No. 651,363.— I. KITSEE. METHOD OF TRANSMITTING ELECTRIC IMPULSES.

The gist of the invention in this case consists in shunting the secondary of the transmitting induction coil, in wave




651,363. METHOD OF TRANSMITTING ELECTRIC IMPULSES.

telegraphy, instead of making and breaking the primary circuit.

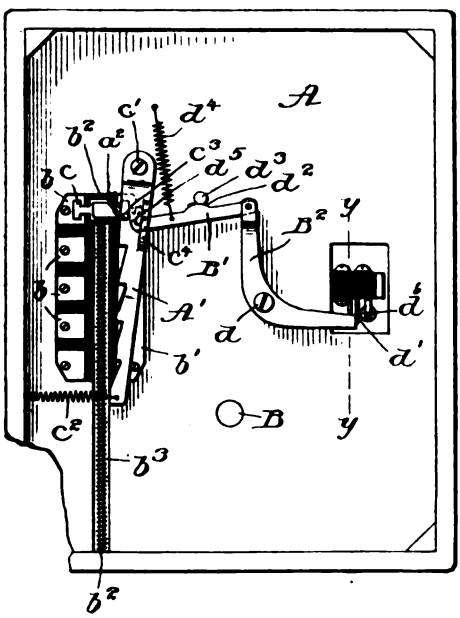
In the figure, the secondary coil is shown connected from ground to the

Digitized by Google

aërial conductor, and a shunt of this coil is completed thru the contacts $g^1$ $g^2$, the contact $g^2$ being carried on a lever $d'$, controlled by a magnet $C$, in circuit with key E. The secondary coil is normally shunted, and the depression of the key E results in the breaking apart of contacts $g^1$ $g^2$ to permit the high-tension interrupted current to pass to the aërial wire. Contacts $g^1$ $g^2$ are immersed in oil.

No. 651,540.—R. T. WATT. AUTOMATIC TELEPHONE SWITCH.

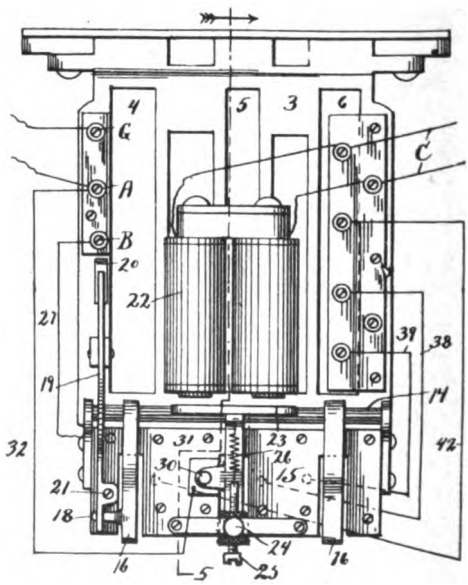
This is a switch for intercommunicating systems which is adapted to be



651,540. AUTOMATIC TELEPHONE SWITCH.

set by the use, and to remain set until the receiver is hung up after the close of the conversation, when the parts are automatically restored. The figure shows the inside of the cover of a box, upon the outside of which the receiver and transmitter are mounted, as well as the switch-hook and selective switch handle. This latter is connected to a sliding switch-head $a^2$, which makes constant contact with the plate $b'$, wired to the local receiver, and slides over the contacts $b$, connected to other station circuits. The head $a^2$ is held where it is placed by notches in a pivoted plate A', pulled over by spring $c^2$. Under the switch-hook end lies the toe of a pivoted lever $B^2$, whose other end is pivoted to loose lever $B^1$, with a hump $d^2$ and a hook finger $d^5$. The hump lies under fixed pin $d^3$.

When the receiver is removed from its hook, the hook rises, the lever $B^2$ turns, and the lever $B^1$ advances to the left until its finger $d^5$ engages pin $c^3$ on the notched plate A'. When the receiver is again hung up, the lever $B^2$ is turned down, the lever $B^1$ is pulled to the right, drawing the latch plate with it, and releasing the switch-head $a^2$, which is forced up by spring $b^3$. The



651,817. TELEPHONE TOLL APPARATUS.

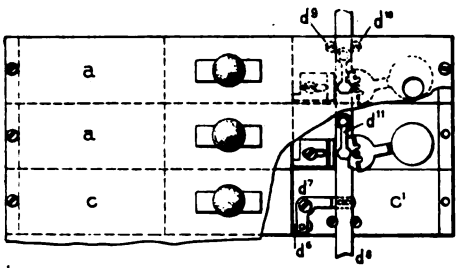
lever $B^1$ has its finger released from pin $c^3$ by the hump $d^2$ passing down under pin $d^3$.

No. 651,817.—J. T. BELANGER. TELEPHONE TOLL APPARATUS.

This is a somewhat complicated apparatus for a pay station. Several slots are provided for coins of different denominations, which, when dropped in, close circuits across from individual insulated sections to the main frame. A coin, when dropped, is temporarily held by the toe of an armature lever controlled by magnet 22 in the finger, this magnet being controlled in turn by a

Digitized by Google

relay in series with the secondary of the station induction coil. In circuit with the individual contact plates are buzzers of different tones, which will communicate their vibrations to the microphone



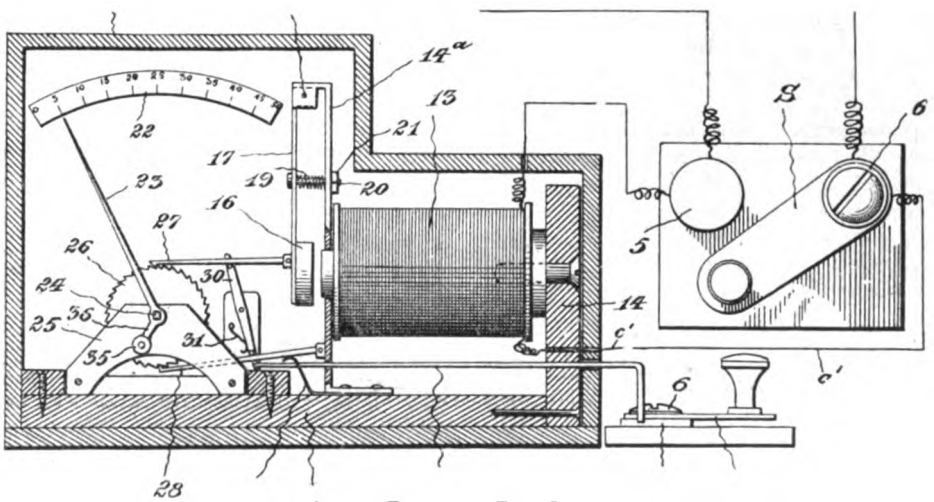

651,936. INDICATING KEY.

and so apprise the answering operator of the denomination of any coin dropped. Ringing current over the line energizes magnet 22 and drops the coin. Apparently an extra circuit is taken to central in addition to the main talking circuit.

No. 651,936.— C. E. SCRIBNER AND F. R. McBERTY. INDICATING KEY FOR SELECTIVE SIGNALS.

This is a device for indicating to an operator which of two stations on a party line has been called by the key in the cord used. Each cord circuit has its own key (*a* in the figure), and in addition there is a common key which is interposed in the generator circuit to change the connections as may be desired. This is shown at *c*. Suppose station A has its ringer connected from one side of the line to ground, and station B from the other side to ground. To call either, the operator must ground the generator and connect it to the proper side of line. This is accomplished by moving key *c* backward or forward, as required, and having thus prepared the generator circuit, it is connected to line by the ordinary individual calling key *a* in the usual way.

After this call has been made and the apparatus used for other calls, the operator may desire to call again, and this she can not do without knowing what arrangement was used. In this case, when the common or circuit-charging key *c* is used it moves a lever $d^8$ one way or the other, and thru its agency moves a series of little pivoted dogs, opposite the regular calling keys, to one side or the other of the centers of pivoted signals (also one for each regular key), shown at the right of the keys. If with the dogs set to a particular position, an individual key *a* is used, its signal will be pushed over by the dog, this being pushed by a projection on the key. The signal then remains until the individual key is used again, serving to indicate what current was last used with that key.



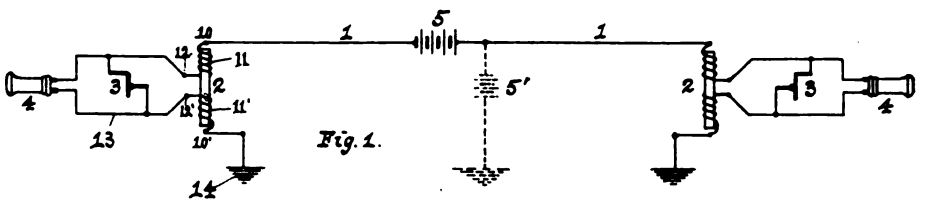

652,272. TELEPHONE TOLL SYSTEM.

Digitized by Google

*June 26, 1900.*

No. 652,272.— J. A. JOHNSON. TELEPHONE TOLL SYSTEM.

This is an arrangement of certain apparatus whereby a visual indication of the denomination of a deposited coin is given an operator. At the subscriber's station is a box with a series of slots for different coins, with inclined ways for the coins to roll down, having contacts varying in number, so that each coin will make a distinctive number of contacts. At central is a step-by-step indicator, actuated to move a step for each contact and provided with a scale arranged to be direct-reading as to the denominations of the coins. A switch S serves to throw the whole apparatus out of service when desired.



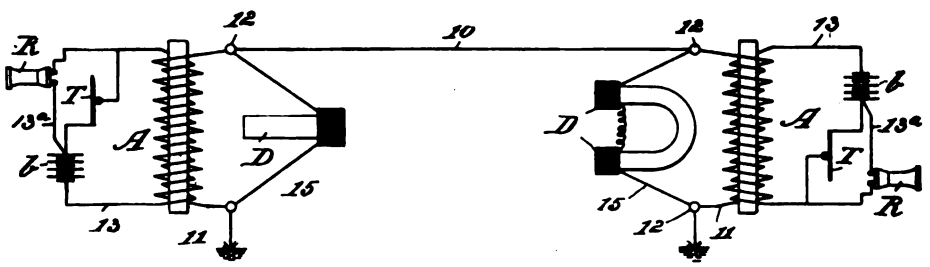

652,459. ELECTRIC CIRCUIT.

No. 652,459.— C. C. GOULD. ELECTRIC CIRCUIT.

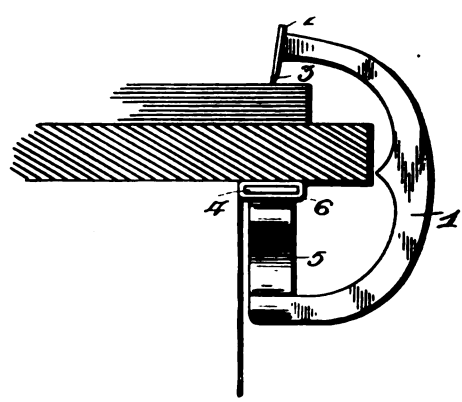
The circuit here described contains "inductive resistance" coils 2 and transmitters and receivers 3 and 4, the coils being in series with the instruments and the instruments being in multiple with each other. The battery may be in series, as shown in full lines, or in multiple, as shown in dotted lines. The inventor claims freedom from inductional disturbances, but it is difficult to understand why any effect of the coils on currents from external sources would not be equally potent in suppressing the voice currents.

No. 652,432.— C. C. GOULD. TELEPHONE SYSTEM.

This is an arrangement of circuits and instruments similar to the last one, except that Mr. Gould puts his transmitter and receiver in parallel with each other in a primary circuit, which in itself has been done before, and connects the secondary to line in the usual




652,432. TELEPHONE SYSTEM.



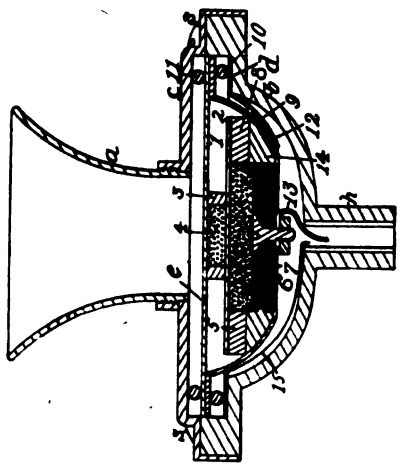

652,507. PAD HOLDER.

Digitized by Google

way. The effect, he says, is heightened by shunting his talking set thru the windings on a permanent magnet D. In other words, the invention consists in putting a transmitter and receiver in multiple, and then shunting the whole set.

No. 652,507.— C. A. BOREE. PAD-HOLDER FOR TELEPHONES.

This is a spring clip having leaf members 5 6 pressing on the lower face



652,508. MICROPHONE TRANSMITTER

of the telephone desk, and an edge 3, thereby held down on the pad.

No. 652,508.— C. B. AND C. E. CLARK. MICROPHONE TRANSMITTER.

This instrument has an outer case *b* with a hub *h*, a metal ring *d* with fingers 12 extending inward and downward, a metal cup 9 within the ring and resting on a rubber gasket 10, a recessed carbon block 6 secured in the cup 9 by plaster of paris 14, wood ring 8 and carbon diaphragm 2, over the carbon block, rubber gaskets 3 over the carbon diaphragm, and an outer diaphragm resting on ring 3 and outer gaskets 11. Granular carbon is filled in between diaphragm *c* and diaphragm 2, and also between the latter and carbon block 6.

"I THINK your little magazine the finest that is published."

J. FRANK KELLEY.

## TRADE NOTES.

THE Electric Appliance Company, Chicago, desires to have the names of all Independent Telephone companies on their mailing list. Their new telephone catalog is about ready for distribution.

R. H. LEAVITT, the well-known dealer in telephone cross-arms, pins and brackets, at Capron, Illinois, reports a large and complete stock on hand enabling him to make prompt shipments at reasonable prices.

THE new C. & S. portable telephone set just placed upon the market by the Couch & Seeley Company has several new and improved features. It is very compact and convenient and fitted with C. & S. hand micro-telephone, series and bridging bell and dry battery.

CENTRAL TELEPHONE & ELECTRIC COMPANY, St. Louis, had just got out a new line of distributing boards, illustrated in Catalog No. 6. The new metallic self-restoring drop is also meeting with much success, several exchanges having been equipped thruout Missouri, Arkansas and other States.

THE new plant of the Champaign & Urbana Phœnix Telephone Company (Illinois) is one of the best of its size in the State. The company has been reorganized, in fact the personnel is new thruout, and composed of some of the leading business men of Champaign. The entire plant has been built over, and new exchange equipments installed, consisting of switchboards, distributing boards and protective devices, all manufactured by the Sterling Electric Company, of Lafayette, Indiana.

AMERICAN ELECTRIC FUSE COMPANY, Chicago, is carrying what is, no doubt, the largest and most complete stock of telephone protective devices in the country. The line comprises the regular styles of lightning and sneak current arresters for single circuits or mounted in bank, as many as may be required. Center-plate lightning arresters, single-pole arresters, Western Union and Postal fuse blocks, give a variety of selection for the most extensive requirements. The line of fuses and fuse links,

Digitized by Google

with McIntire and American joints, and the well-known McIntire specialties is also complete, and enables the exchange manager to equip his plant in the best possible manner.


## Wanted.

COMPETENT telephone man, familiar with line and instrument work. Those with knowledge of switchboards preferred. Address

"COMPETENT,"
Care TELEPHONE MAGAZINE,
Chicago, Ill.

## Wanted.

TELEPHONE SALESMEN. Company has best apparatus, newly equipped works and ample capital. Splendid opportunity for good men. Address, with full information, at once.

SEMCO,
Care TELEPHONE MAGAZINE,
Chicago, Ill.

## Charles A. Brown & Cragg,

**ATTORNEYS AT LAW and SOLICITORS of PATENTS,**

**1450 Monadnock Block, CHICAGO.**

EDWARD E. CLEMENT. WM. D. GHARKY.

## CLEMENT & GHARKY
## Patents and Patent Law

**GENERAL ELECTRICAL EXPERTS**

SEARCHES, REPORTS, OPINIONS

**Stephen Girard Building, PHILADELPHIA.** **McGill Building, WASHINGTON, D. C.**


# Telephone Magazine

## CONTENTS OF THIS NUMBER.


Copper Saving in the Joint Transmission of Direct and Alternating Currents. By Dr. Frederick Bedell ..... 1
A New Telephone Manufacturing Company..... 5
Batteries for Exchange Use. By S. A. Dinsmore... 6
The Manufacture of Wire for Telephone Purposes . 8
A Profitable Field for Extension in Small Exchanges 11
Arrangement and Equipment of New Exchanges. By the Inspector ..... 12
A New Automatic Slot Telephone ..... 15
To Replace the Bell ..... 15
Some New "Central" Telephone Devices..... 16
Talks and Cross-Talks. By the Inspector ..... 17
Editorial ..... 22
A Telephone Trust..... 22
Kellogg Switchboard and Supply Company..... 22
The New Century Transmitter..... 23
Nebraska Items ..... 23
American Enterprise at Paris..... 24
Some New American Exchanges..... 24
Recent Publications..... 25
Independent Items ..... 27
Digest of Telephone and Kindred Patents. By Edward E. Clement..... 29
Trade Notes..... 43



One cent will do more towards laying Mc Roy Conduits than any other.

JOHN T. McROY
302 BROADWAY, NEW YORK
138 WASHINGTON ST., CHICAGO


Digitized by Google

# Telephone Magazine

Copyright, 1900, by Electrical Engineering Pub. Co.

Entered at the Chicago Postoffice as mail matter of the Second Class.

VOL. XVI. CHICAGO, AUGUST, 1900. NO. 107

## THE NEW TELEPHONE "OFFICE 1" IN BERLIN.*

As communicated to our readers on February 15, the telephone offices 1 and 1-A at Berlin were combined into a new office on February 4 with the designation "Office 1." The arrangements for long-distance traffic, for which this office acts for the whole city of Berlin, have not been changed at the present time, because the choice of the system to be used for this purpose depended on the outcome of the experiments with various apparatus of new construction. Now the decision in this matter having been made, it is the intention to install switchboards of a particular form adapted for long-distance traffic, and to do this yet before the end of the year.

In the following we give a description of the new office installed with the most modern principles of long-distance telephone technique, costing in round figures one and a quarter million marks ($312,500.) The same is installed in the same building in which the old switchboard was located. All arrangements are made for complete metallic circuits. At present grounded lines are still used, but they will be changed to metallic lines during this year. The switchboard is adapted to work on either kind of lines.

The office has a capacity of 10,600 subscribers' lines and 1,600 outgoing toll and trunk lines.

The lines enter the office partly aërial, partly underground.

The aërial lines, arriving on an iron standard upon the roof of the building, are conducted in 28-wire rubber-covered cables with lead sheathing to the fuseboard located immediately under the entrance into the building, these fuses offering protection against currents up to 500 volts. It is the intention to mount these fuses in banks of seven on porcelain plates. Each fuse consists of two bronze springs, and one straight brass strip and another strip bent to a right angle, each one carrying a binding post to attach the line wires, a zinc lightning arrester plate with binding post and a heat coil. Each brass strip is connected to one of the springs. The heat coil consists of a glass tube 5 cm. long and 8 mm. diameter and two copper caps; to the latter the fuse wire is soldered of $\frac{1}{10}$ mm. Rheotan wire and passed thru the tube centrically as well as straight. In the middle of the tube the fuse wire is protected by a piece of a thinner glass tube 5 mm. long, covered at both ends with asbestos paper. The glass encasement of the heat coil allows of continuous inspection of the fuse wire. The fuse coil is filled with medium fine carefully dried emery powder. The introduction of the heat coil into the springs connects the metal caps to the line wires.

From the fuses twenty-eight wire asbestos cables lead to the switchboard room, where they terminate upon an iron frame carrying lightning arresters, one lightning arrester being provided for two cables. The continuation of the lines from the lightning arresters to the main distributing board is made in homogeneous cables.

The underground paper cables are partly 27, 28, 30, 56 and 112-wire cables of old construction, partly 56 and 112-pair cables of modern construction. The terminal heads of the single wire cables are located in a special room near the distributing board. The terminal heads

*Translated from an article in the Electrotechnische Zeitschrift of July 26, 1900, by Post Inspector Lindow.

Digitized by Google

for the paired cables in the basement. The cable heads are mounted in two rows above each other upon an iron frame. The terminal heads of the usual construction are connected with the main distributing board by 28-wire respectively 28-pair asbestos cables.

The fuses and lightning arresters for

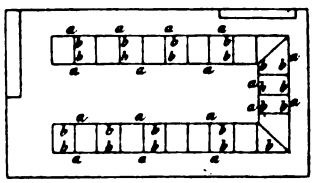


FIG. 1.

the underground lines are inserted at the cable entrance in advance of the cables.

The main distributing board represented in Fig. 1, located in a room 12 by $6\frac{7}{8}$ m. consists of an iron pipe rack of arch construction having one m. opening.

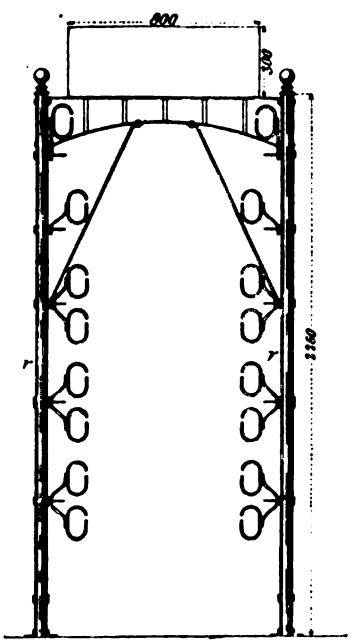


FIG. 2.

Fig. 2 illustrates a cross section of the frame. Fig. 3 part of its plan showing its horseshoe shape. Fifty-four pipes, *r*, *r* (Figs. 2 and 3), each 226 cm. high, 5 cm. outside diameter and 5 mm. stock, are interconnected by iron bars 6 mm. thick and thirty respectively 45 mm. wide, attached to the outer and inner side of the horseshoe frame. On both sides are attached six rails 22.6 m. long for the reception of the hard rubber terminal strips upon which the cables terminate and for the attachment of the rings that hold the jumper wires. Two opposite vertical pipes are joined by heavy iron arches and flat bars. Arches and bars are screwed together with 5 iron bolts forming simultaneously a guide for the jumper wires. Two brackets of round iron, 15 mm. diameter and 85 cm. long, are attached to every other vertical pipe. In longitudinal direction of the frame five rails of half-round iron, 20 mm. wide and 10 mm. long, are riveted to the arches, also serving as a run for the jumper wires. Upon the upper rails of the arches a box, 22.7 m. long, 80 cm. wide and 30 cm. high, is attached to receive the cables entering the frame. This box contains upon its sides slots, one above each terminal strip, for the passage of the cables, the slots being 70 by 50 mm.

The terminal strips to receive the

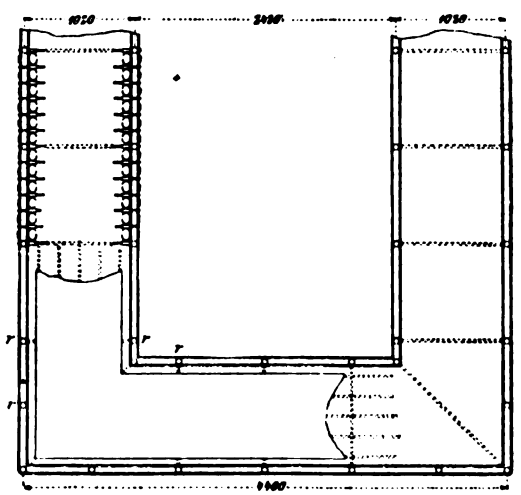


FIG. 3.

cables coming from the lightning arresters and terminal heads are 60 mm. wide and 9 mm. thick and 104.5 respectively 84.5 cm. long. Any two such strips are combined to one strip of 189 cm. total

Digitized by Google

length and attached to the sides of the frame marked *a*, *a*, *a*. The frame contains 268 strips upon which the terminals are inserted in two rows side by side; the upper 40 terminals for the subscribers' lines switchboard side, in the middle 20 terminals for cross-connecting and the lower 56 terminals for the subscribers' lines line side. Each terminal takes a pair of wires. The number of terminals in each group corresponds to the wires in each cable. For the single-wire cables the double amount of connectors is provided in view of the nearing introduction of the metallic system.

The terminals consist of 1.8 by .9 cm. brass strips, the terminals of the lines are cross-connected to the terminals of the switchboard side by asbestos wire; these jumper wires are run thru 2,510 oval loops, 115 by 70 mm. opening, of half-round iron attached partly to the rails and partly to the curved flatirons between the rails, this arrangement being shown in Fig. 2, the loops being designated by *b*, *b*, *b*, in Fig. 1.

From the terminals of the terminal strips the lines are carried in 42 wire cables, silk and cotton covered, to the first switchboard section in the operating room on the floor below. These switchboard cables consist of 42 single copper wires .6 mm. diameter, tinned and double silk covered. Over the silk covering of 20 wires a covering of white cotton, and over the silk covering of the other 20 wires a white-red cotton covering is laid, the one extra wire having a red and the other extra wire a blue cotton covering. Each metallic line consists of a white and white-red wire respectively of the red and the blue wire. All wires are bunched and covered with white cotton. The cable is then enveloped with an impregnated band and provided on the outside with a red and white braid covering; finally the cable is impregnated with a fireproof substance. Each strip of 20 multiple jacks takes such a cable of 21 pairs, leaving one pair spare.

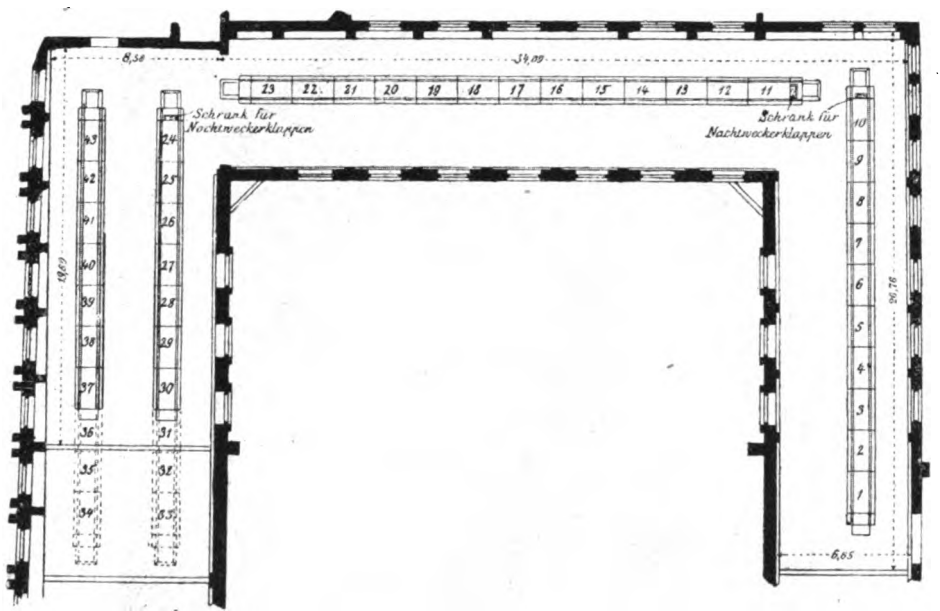



FIG. 4.

The arrangement of the operating room shown in Fig. 4, Fig. 5 giving a view of the left wing, had to suit the present form of the building which brought about the arrangement in horseshoe shape. The operating room has a length of 19.8 by 34.09 and 26.76 m. and the width is 6.65 and 8.58 m. The illumination during the day is effected by a skylight; after dark by arc lights.

The operating room contains, to start with, 37 sections, one row of which is

Digitized by Google

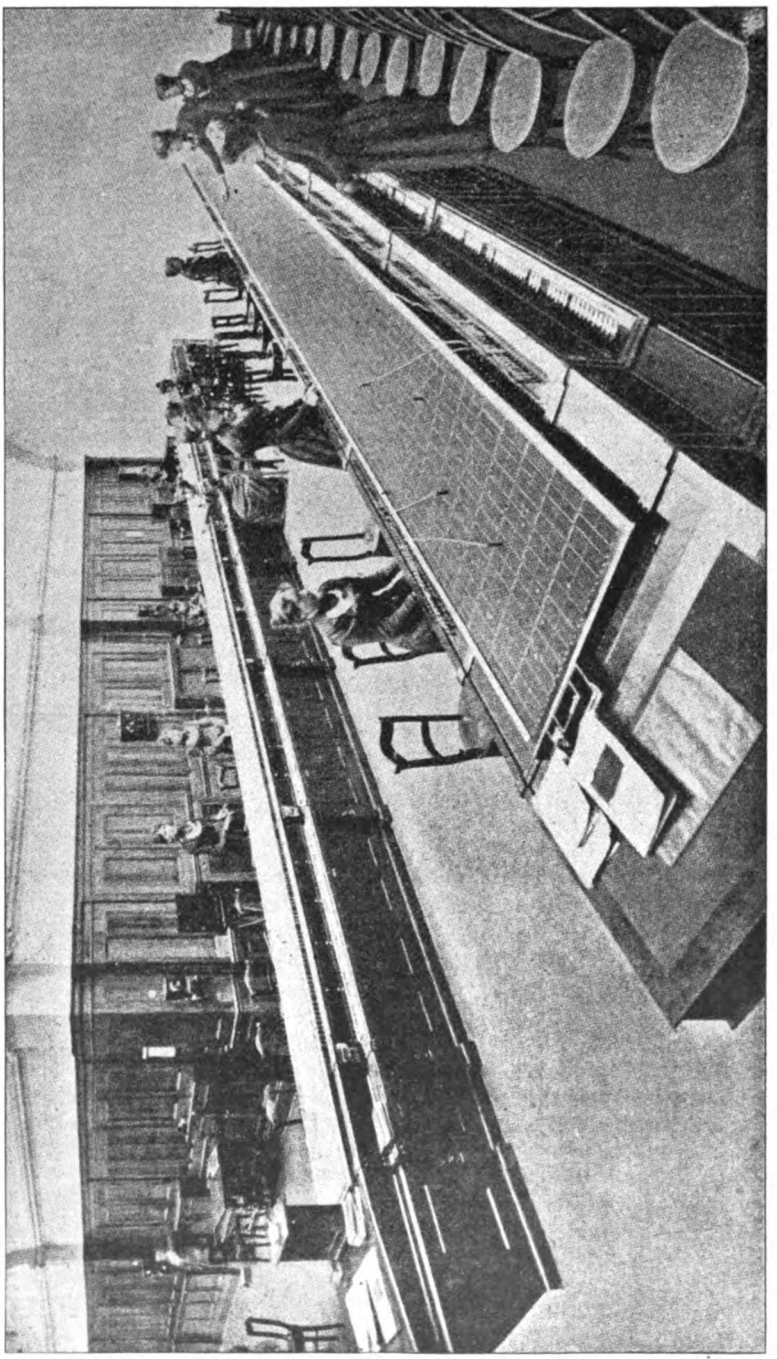


FIG. 5.
VIEW OF LEFT WING.

Digitized by Google

placed in the 6.65 m. wide part of the room, while the 8.58 m. wide part contains two rows. There is room for six additional sections shown in dotted lines in Fig. 4. The board is a multiple board in table form manufactured by the German Telephone Works, R. Stock & Co., Limited, of Berlin.

later. The cord shelf is attached between the jacks and drops; the key-shelf below the drops.

The jack tables and the side panels are set upon a wooden support 100 cm. high. The panels covering the lower sides of the support are removable and the key-shelves are hinged. Figs. 6, 7 and 8

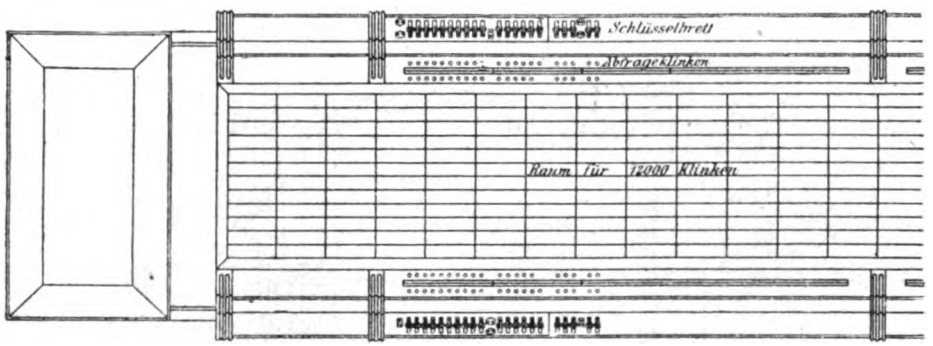



FIG. 6.

Ten sections are exclusively for local lines, the others half for local and half for trunk lines; last section having operators on each side.

Each half of a local section contains at its front 200 calling drops, 200 answering jacks, divided into five groups, 45-cord equipments (two plugs and cords with cord weights, one lever key and one clearing-out drop) and three operators' equipments (one mikrophon and receiver and one key). The subscribers' lines

give plan, elevation and cross-section of one section.

The jacks are mounted twenty on one rubber strip. The answering jacks are located in the plug shelf, the multiple jacks in the jack table. The surface of the multiple jack strips is roofed, i. e., slanting down from the middle and provided with numbers readable from each side of the section. The strips are screwed upon the iron frame of the tables and can be lifted out from above.

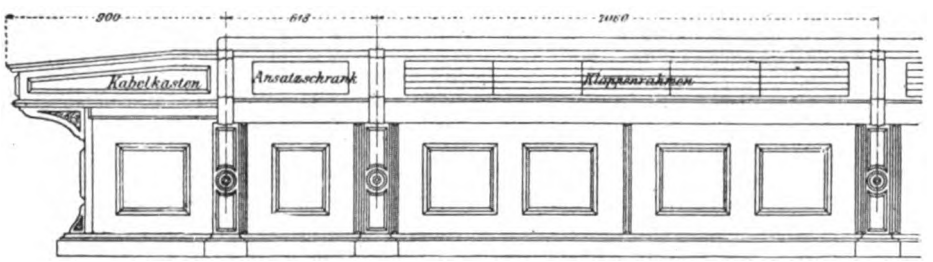



FIG. 7.

arranged for two-cord system are distributed over three positions. This system allows one position to help out the adjacent positions. The table with the multiple jacks is common to both sides of the section.

The arrangements for the trunk lines upon the multiple table will be discussed

Sixty-three wire, cotton and silk-covered cables containing $\frac{6}{10}$ mm., tinned and double silk-covered copper wires, 20 white, 20 white-red and 20 white-blue cotton-covered, are used for the short multiple cables and for the cables from the last multiple to the calling drops (return cables). One wire in each cable

Digitized by Google

is covered red-blue-yellow. The white-blue wires serve as test wires, of which we will speak later. The rest of the cable construction is the same as of the 42-wire cable. Each strip of jacks takes one cable, leaving three spare wires.

of the cables, and makes it possible, even if the jack-table is fully equipped, to insert the hand between the cables and lift each one out.

The cable entrance from the cable run into the switchboard is covered with a

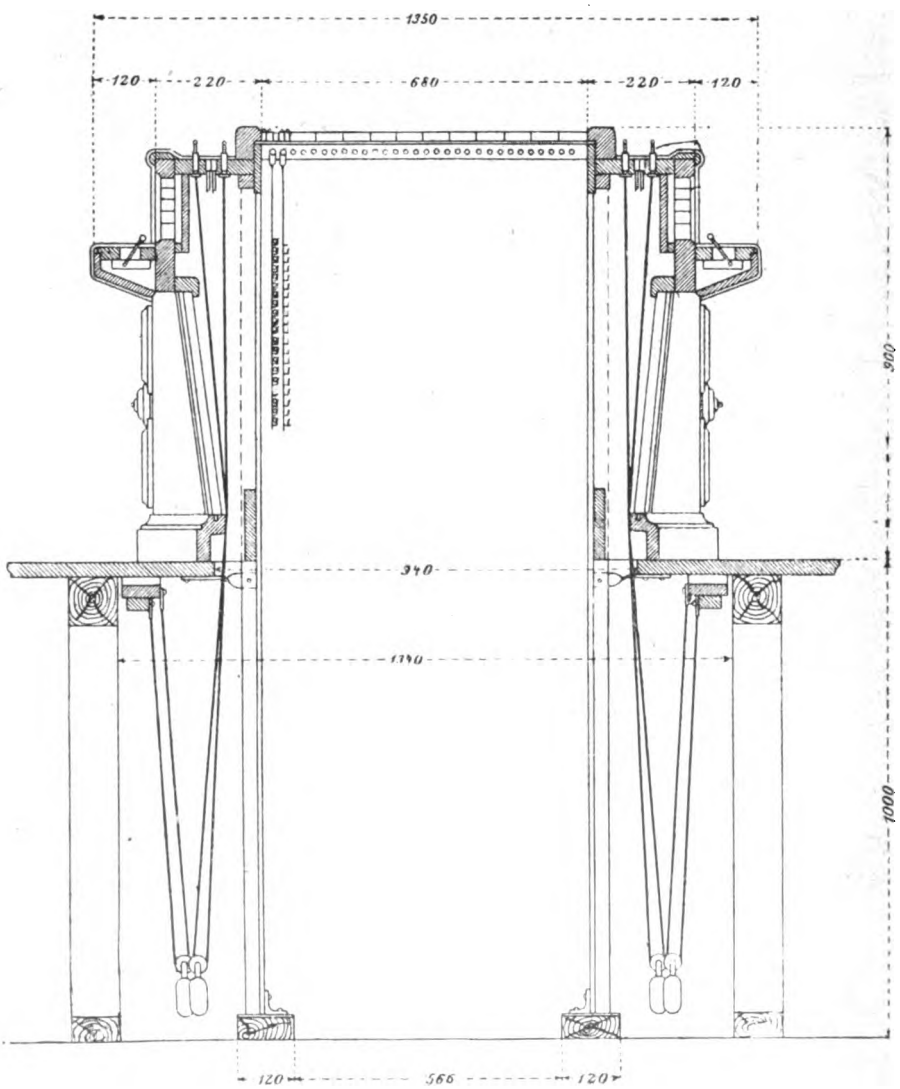



FIG. 8.

The multiple cables and the return cables are supported in cable supports with hooks. The supports are hung to iron rails below the jack-table, as shown in Fig. 8. This arrangement allows of a compact and easily accessible suspension box panel, the top of which serves as a writing desk for the monitor, Figs. 6 and 7.

In the arrangement of the calling drops the armature is suspended between two screws in the rear of the drop and

Digitized by Google

carries a long hook which holds up the shutter in front. If the armature is attracted the hook releases the shutter. The shutter, also pivoted between two screw points, turns thru 90°. The

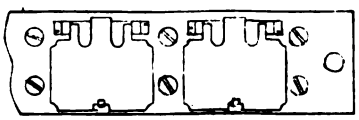


FIG. 9.

armature has no spring attached to it, but returns by its own weight into normal position. The stroke is regulated by a brass screw inserted into the armature. The drop spools have a resistance of 140 ohms.

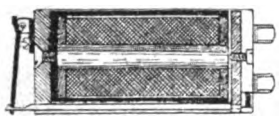


FIG. 10.

The drops are provided with night alarm contacts. The night circuit is arranged as follows: For each half of a section a separate self-restoring drop is designated, the shutter of which falls every time the shutter of a line-drop

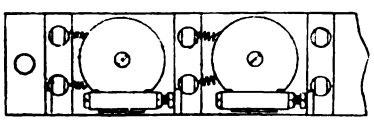


FIG. 11.

falls. Thereby it may be recognized easily on which section the call came in. Altogether there are 88 drops combined in two of 24 drops each and 40 in one cabinet. The cabinets are mounted on

FIG. 12.

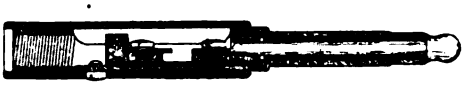


FIG. 13.

the monitors' desks that form the box panels. See Figs. 4 and 6. The size of these special drops represent a surface of 4 by 5 cm., so that they can be recognized from the opposite ends of the switchboard. The manual restoring of the line drops effects at the same time the self-restoration of the night circuit drops. The night circuit drop for each

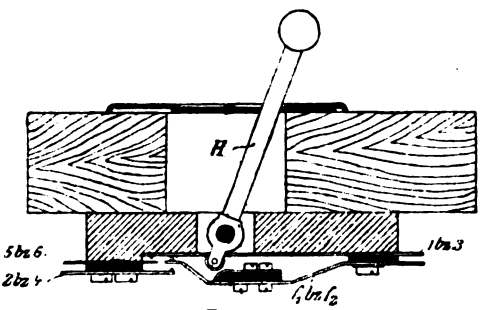



FIG. 15.

section can be cut out of circuit if desired.

The construction and arrangement of

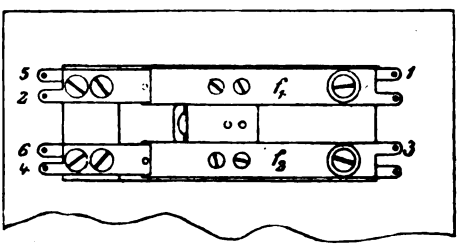



FIG. 16.

the clearing-out drops, wound to a resistance of 600 ohms, is represented in Figs. 9, 10 and 11.

The plugs consist of three metal parts

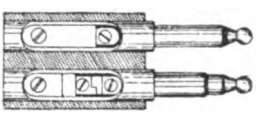


FIG. 17.

insulated from each other. Fig. 12 gives an outside view, and Fig. 13 a cross section of a plug; the circuit connections

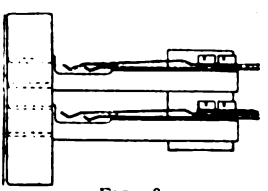


FIG. 18.

for the plugs can be easily traced from Fig. 14.

The cam lever listening key, represented in Figs. 15 and 16, consists of two

Digitized by Google

flat springs $F_1$ and $F_2$, arranged parallel with a small distance between them upon an insulated base. When manipulating the cam key the lower end of the double armed lever H, being provided with a small roller, presses the springs down. The springs have platinum contacts, which make contact with springs 1 and 3 or 2 and 4 according to the position of the lever. In the last-mentioned position the springs 1 and 3 come in contact simultaneously with 5 and 6. The connections of the key can be traced from Fig. 14.

the cutting-in of the operator's telephone. All lines are connected so as to pass from the first section, first thru all the multiple jacks of all sections, and after that to the answering jack and drop, thereby in each connection the calling drop is cut off. The description of the operation will show this in detail.

The calling current generated at the subscriber's station passes first thru all the multiple jacks *k* of all sections, then thru the answering jack *k a*, and then thru the calling drop *k l* either to

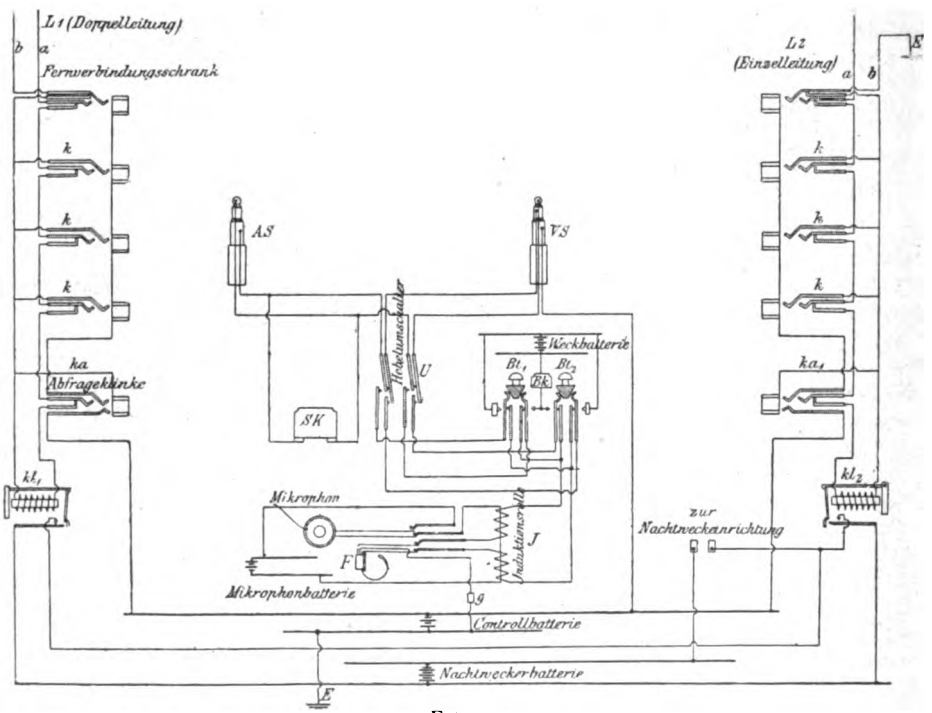



FIG. 14.

The operator's talking circuit is provided with a chest transmitter and a head telephone, which is connected to the switchboard by the insertion of a double plug, Fig. 17, and to a cut-in jack, Fig. 18.

Fig. 14 represents the circuit for two subscribers' lines (the metallic line and the grounded line). The connections are made by two plugs connected by cords. According to the position of the listening key the connection between two subscribers is effected directly or by ground or back over the *b* wire of the metallic line. This throws the drop *k l*. The operator seeing the drop fall, inserts the answering plug A S of any pair of cords into the answering jack *k a*, thereby interrupting the current thru the drop, and with proper position of the key U a new circuit is established thru this key, thru a battery key B *t*, the head telephone F and the operator's induction coil J to ground respectively over the *b* wire of the metallic circuit. The battery in the operator's circuit is

Digitized by Google

in circuit as long as the answering plug remains in the answering jack.

After having received the number of the desired party, the operator tests whether the called-for line is busy or not. For this purpose she keeps herself cut-in on the line and touches the ring of the multiple jack of the called-for subscriber with the tip of the connecting plug V S. She receives a "click" in her ear if the line is busy. The electrical proceedings herein are as follows:

The rings of all multiple jacks belonging to one and the same subscriber's line are joined together (test line). The introduction of the plug on any position connects this test wire with the negative pole of the test battery, the positive pole of which is grounded. As soon as the tip of the connecting plug on any other section touches the ring of a plug connected to this test battery, the test battery sends a current thru the listening key, thru the battery key B $t_2$, thru the operator's induction coil J over ½ of the winding of the head telephone F and over the impedance coil $g$ of 600 ohms to ground. If the line is free no current passes from the test battery to ground, and no "click" is audible.

To connect the called-for subscriber's line to the calling subscriber's line, the connecting plug V S is inserted into the tested jack and the lever of the listening key U laid over; thereby the two wires of the line are put in direct connection. The clearing-out drop S K is permanently bridged across the two wires of the answering plug A S.

In order to call a subscriber from the office a plug is inserted in the subscriber's jack, the listening key U is operated and the battery key B $t$ pressed down. As call battery an inductor of from 26 to 28 volts tension is used for all positions in common; the armature of the inductor is permanently rotated by a small electro motor. The falling of the drop B $k$, which is wound to a resistance of 140 ohms, indicates that the battery had begun to operate. Special arrangements are made to indicate lines in trouble. That particular wire of the pole-changing battery which is connected to the $a$ wire of the line when calling, is extended to a free multiple table and there connected to a middle rail. To this rail single cord plugs are attached, the tips of which are cut down so that when the plug is inserted it only makes contact with the sleeve and neither touches nor lifts the springs. Is a line to be designated as in trouble, one of these plugs is to be inserted in a jack belonging to this line. On all positions the rattling of the pole-changer indicates that the line is busy when the operator tests. This arrangement makes it possible for the inspectors, if the trouble is cleared, to call up the office and cause the line to be put in normal connection.

The trunk lines between the Office 1

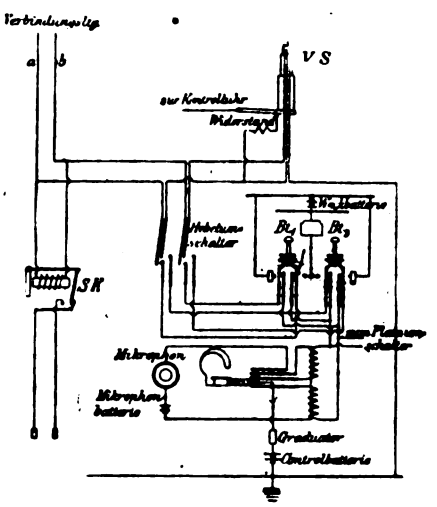



FIG. 19.

and the other offices in Berlin, and partly also the lines to the suburbs of Berlin, are incoming and outgoing trunk lines, i. e., these lines are used exclusively out to other offices or arriving from other offices. In correspondence with this method of operation the lines have received a simplified single-cord circuit. The outgoing trunk lines are connected to the jacks while the incoming trunk lines are brought directly to the drops without going thru the multiple. The office has the capacity for 1,600 outgoing and 1,485 incoming trunk lines. Each half of a section can take forty-five incoming trunk lines distributed over three positions; on account of the heavy

Digitized by Google

traffic at the present time each position is equipped with ten lines only.

The trunk circuit is shown in Fig. 19. Each trunk line terminates in a two-conductor cord and this brought directly to a lever key. By manipulating the lever of the key one way the line is connected directly to the plug; by manipulating the lever the other way the operator's telephone circuit is bridged across the line. The calling drop, which acts also as clearing-out drop, and which is constructed the same as the clearing-out drop in the subscribers' lines, is permanently bridged across the wires *a* and *b* of the trunk line. The test and the connection of the line with the subscriber's line is effected by the plug V S in the same manner as for the connection of two local subscribers. As each trunk

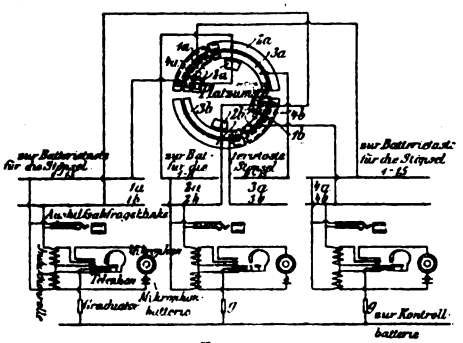


FIG. 20.

line is permanently connected to a plug, one position can not assist an adjacent position without the use of a position-changer, by which the lines arriving in one position may be connected to one, two or three positions of the same section. Fig. 20 represents the circuit of such a position-changer. The connections are made by means of a universal joint switch. If the switch lever is pressed to the left as shown in above figure, all lines are connected to the middle position, the segments 1 *a* being connected to 2 *a*, 1 *b* to 2 *b*, 3 *a* to 4 *a*, 3 *b* to 4 *b*, 2 *a* to 4 *a* and 2 *b* to 4 *b*.

In the vertical position of the switch lever, Fig. 21, the trunk lines are divided between the first and the third position; when the switch lever is pressed to the right, Fig. 22, the trunk lines are divided over the positions 1, 2 and 3.

For outgoing trunk lines such lines are used which are free in both offices.

In order to ascertain quickly whether a line free in the one office is also free in the other office, the following controlling arrangement is made:

The escapement of an ordinary clock terminates in an armature *h*, which moves

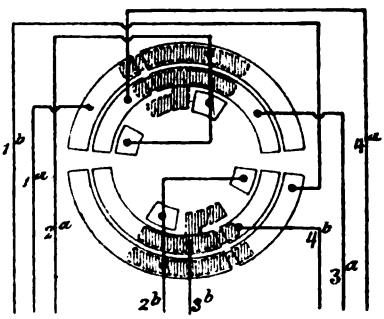


FIG. 21.

between two fixed contacts, *c* and $c_1$, as the clock goes the armature makes contact alternately with the one and the other, and thereby cuts a resistance W of 500 ohms in and out of circuit. The current changes caused thereby in the winding ($i^1$) of an induction coil J are transferred to the winding $i^2$ upon lines in which same are noticed as short accentuated clicks corresponding to the ticking of the clock; to prevent these

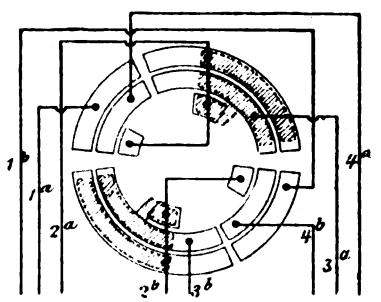


FIG. 22.

clicks from being introduced on neighboring lines the wires are normally connected to ground. The line wire *a* of each trunk line passes thru a resistance of 700 ohms, an automatic key and the winding $i^2$ of the induction coil J to ground. In normal position the plug V S presses the lever *m* of this key upon contact *k*, whereby the line wire *a*

Digitized by Google

is connected thru the resistance W with $i^2$. Lifting of the plug opens the circuit and cuts the clock out. Whenever the clicks are audible on a line then the line is free and can be used for a connection. This controlling arrangement is shown in Fig. 23.

Storage cells are used for batteries uniting four cells in one tank. The cells, System Boese, have a tension of two volts. The operators' transmitters are served by a battery consisting of four tanks having their cells connected in parallel. Instead of connecting the transmitters singly to the poles of the battery a cable is connected to the bus-bars of the power board in which the

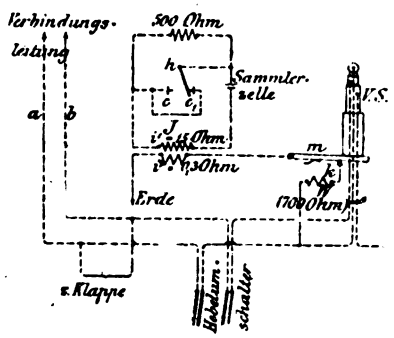



FIG. 23.

battery leads terminate. These cables passing along the sections and fanning out to the transmitters to prevent induction on the different positions a resistance of the battery leads is made very small by using a cable of 19 strands of 1.5 mm. tinned copper wires. This decreases the resistance so much that no perceptible inequalities in current distribution upon the transmitters are effected. The ends of the cables, which are well insulated, are returned to the battery bus-bars. A storage battery cell is used for test battery and for the controlling clock in the trunk lines, also the storage battery of 2 volts tension is used.

---

CENTRALIA, MO.—The Centralia Telephone Company was incorporated here the other day for $6,000, with J. A. Chance president and A. Bishop Chance secretary and treasurer. The corporation is to continue for fifty years.

## TO REPLACE THE BELL.

WHITEHALL, WIS.—The Anadia Telephone Company is building a line from here to Pigeon Falls and Hah, where it will connect with the Ossio Telephone Company. The Ossio line will build from there to Madison.

SENECA, ILL.—The Graves & Hyer Telephone Company has been incorporated, with a capital stock of $4,000, to operate telephone lines. The incorporators are W. A. Graves, Charles Hyer and Robert Knapp.

WEST MILTON, OHIO.—The Progress Telephone Company has completed its line to Phillipsburg, so that our people can talk direct to that place. This company will build an up-to-date telephone exchange in West Milton at once, bringing all the farmers in Union township, who wish it, to the Milton exchange by individual lines. This enterprise should be encouraged by all our people.

LARRIE, OHIO.—Work upon the new telephone line connecting DeCliff and Scott Town is being prosecuted with great vigor, and soon communication will be established.

THOMPSON, PA.—The Northwestern Pennsylvania Telephone Company, of the Borough of Thompson, Susquehanna county, has been chartered at the State Department, with a capital stock of $10,000, to construct telephone lines in the counties of Susquehanna, Wayne and Lackawanna. The directors are A. H. Crozier and S. S. Hubbard, of Thompson.

PHILANTHROPY, OHIO.—The Butler County Western Telephone Company has been incorporated here to conduct a telephone system. The capital stock is $5,000, and the incorporators are J. Moorhead, C. Conn, W. S. Beard, S. E. Fue, and others.

RICHMOND, VA.—The Louisa Telephone Company's new line has been completed from Richmond to Louisa Courthouse and Gordonsville and intermediate points. This line is one of the links of the recently organized independent company, the Virginia Long-Distance Telephone Company, whose lines are to reach the principal Virginia points.

Digitized by Google

FIG. 1.—DIAGRAM OF SWITCHBOARDS.

Digitized by Google

## TELEPHONE SWITCHBOARDS.

BY P. P. CLAUSEN.

In preparing this series of articles the writer purposes to treat the subject of telephone switchboards in general. In the first section of the article a general synopsis of the requirements of a switchboard will be given. That is to say, the question of what type of switchboard is the most suitable under certain conditions will be discussed. Generally speaking, the term switchboards as applied to telephony usually indicates some means which may have been provided for connecting together in any desired combination a number of telephone lines centering at a central point, and the name switchboard may well be applied to any such means as have been provided for connecting together circuits normally separated from one another. In order to place the subject of telephone switchboards before the reader in an easily understood manner, the writer has prepared a diagram shown by Fig. 1. At the extreme left it will be observed that there are two items, namely, multiple jack switchboards and divided exchange switchboards. The multiple jack switchboard, as it is well understood, is of a construction in which every subscriber's line terminating at a given central point may be connected with by an operator stationed at any given call-answering position of the switchboard. As will be described later on, this type of switchboard differs from the divided exchange type in the respect that one operator may reach any subscriber connecting to the switchboard without being required to leave her position at the switchboard or ask another operator to aid her in completing a called-for connection. However, a more detailed description of the multiple switchboard system will be found as we go along.

Item B, "divided exchange switchboards," is meant to cover all forms of switchboards in which a given subscriber's line connecting switch or spring jack appears only once in the entire switchboard. In the divided exchange type of switchboard an incoming call is responded to by an operator, and the called-for connection made either by directly connecting with the called-for party's answering jack, or by extending the connection to another section of the switchboards by means of an auxiliary electrical circuit and by the aid of a second operator. A number of such systems will be described in their proper place as we proceed with the general description, and it will, therefore, not be necessary to give a more detailed description at the present time.

Both items A and B, i. e., multiple and divided exchange switchboards, may now be divided into three classes, as follows: Class C, ring down, magneto call or manual call switchboards; Class D, automatic signal switchboard; Class E, central battery switchboards.

Class C, "ring down, or manual call switchboards," includes all switchboards in which the calling subscriber is required to perform a preunderstood manual act in generating an electrical current for the purpose of actuating a signal receiver at the central office; thus in the well-known forms of magneto-board systems and magneto-call telephones, the signal current is generated when the subscriber drives the magneto-electric generator which comprises a part of his station equipment. Class C further includes all switchboards in which the subscriber is required to press a button or turn a switch before he can make his request upon the operator for a connection with another subscriber's line. This applies, particularly, to the Law system, in which a certain number of subscribers are allotted to a given operator, who receives the orders for a connection from the subscribers direct and without the aid of an incoming call signal.

Class D, "automatic signal" switchboards, is meant to cover all such forms of switchboard systems in which the subscriber's call for attention is transmitted automatically when the subscriber removes his hand telephone or receiver from its supporting switch hook, and where the subscriber's request for a disconnection or conclusion of the interconnection is automatically made known by his replacing the telephone receiver to its normal position upon the switch hook. In this form of switchboard it will be understood that the subscribers' stations are equipped with local trans-

Digitized by Google

mitter batteries. In other words, the current for the subscribers' transmitters is supplied by a circuit entirely separate from the line-wires which connect to the central office switchboard.

Class E, "central battery" switchboards, covers all systems in which the subscriber's station equipments are not supplied with a source of current for sending signals to the central office, or for the purpose of energizing the subscriber's telephone circuit. It is, of course, understood that this system embodies the automatic signaling to central office feature, which is also contained in Class D.

Now that we have given the three master systems, that is, the "ring down," "automatic signal" and "central battery," it becomes necessary to analyze each of the systems and learn where they may be applied in practice. Taking the "ring down," or manual call class (referring to the diagram), it will be observed that they may be applied to three master systems, namely:

Class F, "toll-line switchboards";

Class G, "main exchange switchboards";

Class H, "branch exchange switchboards."

Class D, "automatic signal" switchboards, however, can only be applied to the main and branch exchange systems, as it would not be practicable to apply the automatic signal system successfully to toll-line systems, as there would be so many variable factors involved in the construction of toll lines, toll switchboards, toll-line telephones and their operation. This same exception applying to the central battery class, as it would be entirely out of the question to operate toll-line circuits on the central battery plan, or at any rate it would not be good practice to attempt giving such service. Again referring to the diagram, it will be observed that Class F, "toll-line" switchboards, is divided into four sub-classes. These sub-classes indicate the form of line signal or incoming call signal that may be used on a toll-line switchboard, thus:

Class I, main line drop;

Class L, main line relay with secondary drop;

Class M, main line relay with secondary target;

Class N, main line relay with secondary lamp.

The above, therefore, gives us four possible fundamental ways in which incoming toll calls may be made to record the signal.

Classes D and E, that is "automatic signal" and "central battery" switchboards, may, however, be constructed in a great many different ways. Thus the diagram shows that there are nine sub-classes which may easily be utilized in the main and branch exchange systems. Thus:

Class I, main line drop;

Class J, main line target;

Class K, main line lamp;

Class L, main line relay with secondary drop;

Class M, main line relay with secondary target;

Class N, main line relay with secondary lamp;

Class O, main line drop with local cut-off relay;

Class P, main line target with local cut-off relay;

Class Q, main line lamp with local cut-off relay.

In following these articles the writer believes it advisable that the reader retain a copy of Fig. 1 in order that the succeeding descriptions and diagrams of systems may be thoroly understood, and that references to classes by letter may convey a ready understanding of the subject under consideration.

### SELECTION OF A SWITCHBOARD.

When the manager of an exchange or telephone system is called upon to select a switchboard for use in his exchange system it very often occurs that he makes a serious mistake in the selection. This occurs particularly in such instances where the non-technical manager is not assisted by technical advisers who are connected with his company, and therefore give the interests of the company the first consideration. Thus for example, classes A and B, representing respectively multiple and divided exchange switchboards, are the first consideration in the selection of a suitable

Digitized by Google

board for use in a given exchange. If the number of subscribers' lines to which it is desired to give interconnecting service reaches the 500 figure, the multiple switchboard presents a very desirable equipment to the uninformed manager, and in comparison the divided exchange type of switchboard seems to be an undesirable equipment. After deciding upon the type of switchboard, the manager's next consideration will be given to the question whether a manual call, automatic signal, or central energy board shall be adopted. (The reader will understand that classes C, D and E may be made up into boards represented by the classes A and B.) This is generally as far as the manager goes, and the switchboard is ordered without, in a great many instances, giving any consideration to any one of the nine classes embraced by I and Q.

Now, then, as to what type of switchboard should be selected for a given exchange system, opinions differ. It is the writer's opinion, however, that in an exchange in which the immediate capacity is less than 500, or even has already reached the 500 mark, it is not often advisable to install a multiple switchboard, whether it be of the C, D or E class. The writer believes that a divided exchange type of switchboard constructed either for the manual call, automatic signal, or central battery system, is by far the most suitable one. In the event, however, that the exchange has already reached a total of, say, 800 subscribers, and that all indications point toward an early increase in the number of new subscribers, it certainly would be advisable to install a multiple switchboard. This does not, however, mean to imply that the divided exchange type of switchboard is incapable of giving service, and good service at that, even if the number of subscribers connected to it exceed 800 or 1,000 lines. One of the chief reasons which the writer might advance for his preference of a divided exchange type of switchboard to the multiple type in exchanges of 500 lines or less, is that the multiple switchboard consists of a great many more pieces of delicate apparatus, and that the care of such apparatus can not be intrusted to inexperienced people. In other words, the switchboard caretaker must at least have had some practical experience with the multiple switchboard before he can undertake to remedy troubles and replace defective or damaged parts of the equipment. Take, for example, a man who has had experience in taking care of switchboards of the divided exchange type. In this form of board each subscriber's connecting circuit terminates in a signal receiver and a single-line connecting jack, of which there are 500 sets in a 500 switchboard equipment. Now, then, in a multiple switchboard there are a total of 500 line signals and 500 answering jacks connecting directly to the line signals. Then, in addition to this, there are 1,200 multiple jacks connecting to the answering jacks of the 500 lines. This gives us a total of 1,700 jacks to take care of, against the 500 jacks which appear in the divided exchange type of switchboard. As it is well known, another feature of the multiple switchboard is that the connecting jacks are assembled into as compact a shape as possible. As a matter of fact, in the more advanced types of switchboards 100 jacks take up a space of no more than 2½ by about 11 inches. In other words, the jack openings are set to ½-inch centers, and if each jack contains two, and in a great many cases it contains four and even five springs, it is obviously necessary that at least one wire be connected to each and every one of the springs, which, with four springs to each jack, will give us a total of 400 wires connecting to a section of 100 jacks. The wires which connect to these jacks necessarily require a great deal of care in soldering and forming up, and if any repairs are made in a jack belonging to a certain hundred, the repair-man must possess some considerable experience with the operation of multiple switchboards, as otherwise a great deal of damage might be done. Nor is this the only element of a multiple switchboard which requires to be carefully handled, as there usually are special systems of test circuits, transfers, etc., the construction and design of which usually calls for the services of a switchboard caretaker, who can and does demand a greater

Digitized by Google

salary than the manager of a 500-line exchange could afford to pay.

Presuming, however, that the manager has decided upon a given system of switchboards, his next consideration would be given to the selection of the type of switchboard — either the magneto call, centralized call, or full central energy system. In the magneto call type switchboard it would only be necessary to equip the exchange with the usual system of transmitter batteries and such batteries as may be needed for busy test purposes when the switchboard selected is of the multiple type. If, however, a centralized call switchboard is selected it becomes necessary to provide a system of batteries at the central office having sufficient capacity for supplying the incoming call-signal current, as also the current required for operating the clearing-out signals whether they be of a lamp signal or target type. In the event that the central battery (Class E) switchboard is selected, the central office must be equipped with a much greater battery capacity, for it is necessary to supply current for the incoming-call signals, clearing-out signals, and the current required for operating the subscriber's telephone circuits. This calls for a much larger battery equipment than would be required for the centralized call type of switchboard, and results in the production of a service, the efficiency of which, as regards transmitting and supervision of calls, is no greater than that possessed by the centralized call type of switchboard. Now, then, as to the advantages of the three systems, as compared with each other, it needs only to be said that the magneto-call type of switchboard is much slower in operation than the centralized call and central battery switchboards. In this respect the magneto-call system appears to be at a disadvantage, but when it is taken into consideration that it requires a pretty serious case of line trouble to cripple the magneto-call system, whereas in both of the automatic signal systems the slightest line trouble often results in a serious interruption of service, the disadvantages of the magneto-call system do not appear so great. Another point in favor of the magneto type of switchboard lies in the fact that service may be given to toll lines of almost any description and character without requiring the use of any special signaling apparatus, or repeating coil equipments.

Now, then, comparing the centralized call and central battery systems with each other, we have another advantage in favor of the system using a local battery at the subscribers' telephone station. For, as it is well known, it is a very difficult problem to adapt the usual telephone line systems to a system which would give good service if the subscribers' telephone batteries received their current from a centralized source. And as regards the efficiency of service between the telephones of a centralized call system and toll-line telephones, as compared to the service between central battery telephones and toll-line telephones, everything is in favor of the centralized call type. For there is nothing which gives better service than a set of batteries placed in a local transmitter circuit. Such instruments when connected together with toll lines will result in giving a thoroly satisfactory service, and that certainly is more than can be said of any central battery system yet put into successful service. Presuming, however, that the manager has decided upon the kind of an equipment he desires to adopt, he should consider the type of line signal used chiefly from an economical standpoint, for it must be taken into consideration that when the central office equipment calls for a large amount of current, the operating expenses are increased considerably.

The cheapest form of signal which may be used in either Class C or D is the ordinary drop type. In this form of switchboards the current required can be maintained at a very low figure. As a matter of fact, Class C would require no current whatever as regards the signaling, whereas Class D would only require a sufficiently strong current for throwing the drop shutter. This current might be kept down to a very low margin, as the ordinary drop shutter is usually a very efficient piece of apparatus. Class J, however, calls for the provision of a larger quantity of current. And Class K a still larger quantity. Classes L, M,

Digitized by Google

N, O, P and Q call for about the same percentage of current, and when such systems are adopted it should not be forgotten that it is necessary to expend at least $800 or $900 for a power equipment which includes the provision of storage batteries, battery-charging machines, switchboards, measuring instruments and interconnecting switches. Nor should the fact be lost sight of that the charging dynamos must be driven by some source of power, the cost of which must then be added to the operating expenses of the exchange system.

After going over the above the writer believes that the reader will have gained a general idea as to the requirements of a switchboard equipment for central office systems, and in order to aid the reader in making known his needs in the line of central office equipments and permit him to draw up his own specifications when asking the manufacturer for a proposition for equipping his office with switchboard apparatus, extracts from the following form of specifications may prove useful:

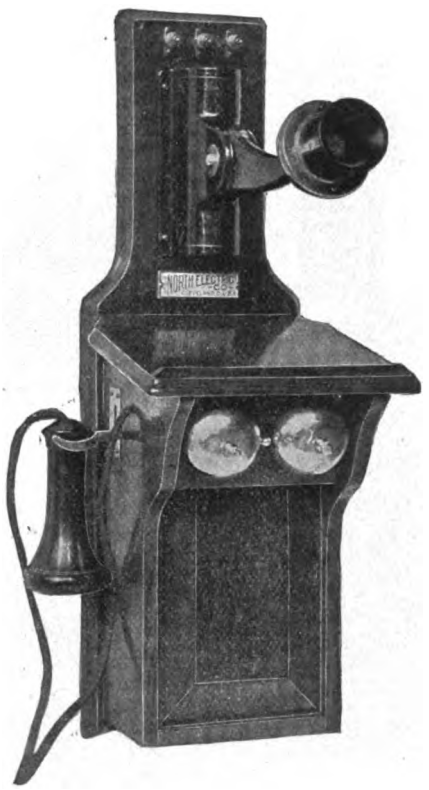
NOTE.—The specification is being used in connection with switchboards belonging to Class A and its subclasses, but with a few changes in construction may easily be made to apply to divided exchange type apparatus, i. e., Class B.

*(To be continued.)*

## THE LATEST CENTRAL BATTERY SYSTEM.

Probably few of the telephone systems that have ever been placed on the market are deserving of the attention due "The North Supervisory System," recently brought out by the North Electric Company, of Cleveland, if it accomplishes all that the manufacturer claims for it. The Company calls it "The New Dividend Payer."

It is of the central battery type of telephone systems, having signaling equipment located at the central office, and being so arranged that the subscriber, in calling up the operator, does so automatically by merely removing the receiver from the hook, the subscriber giving a clearing-out signal whenever the receiver is restored to its normal position on the hook. On the removal of the receiver from the hook an automatic, gravity restoring line signal is shown at the switchboard, indicating to the operator that a call is wanted. The operator, on inserting the answering plug of a pair of cords into the line jack, restores the line signal automatically, and at the same time establishes a connection of her own set with the lines, so that she is immediately enabled to ascertain the number desired by the subscriber. On insertion of the calling plug into the line jack of



SUPERVISORY WALL TYPE.

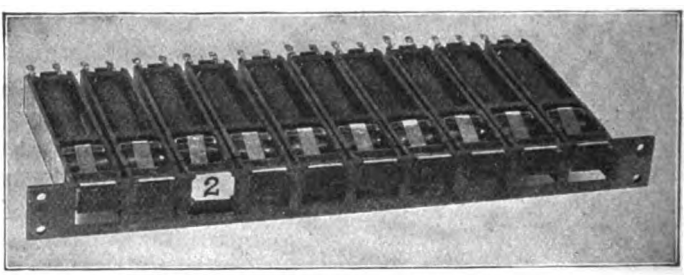
the subscriber desired, a call is sent onto the line by throwing a lever switch, which cuts out both the operator's set and the calling subscriber while the generator current is on the line. In connection with each side of the cord circuit is a supervisory signal, same being preferably of the automatic restoring type similar to the line signal, indicating when the called subscriber has answered, when either one of them has finished talking, or when either of them wants a subsequent call. The operator never has to

Digitized by Google

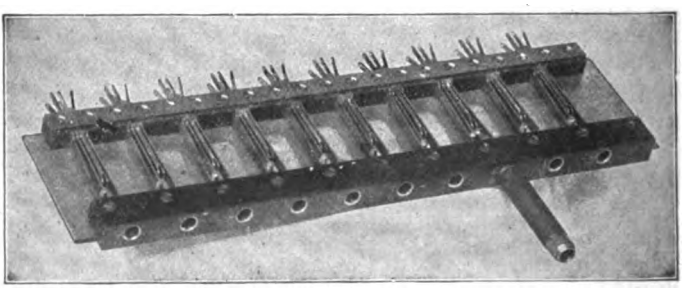
cut in on the line to ascertain whether the parties have been brought together in conversation ; in fact, at no time has she to go on the line except to ascertain the number of the subscriber wanted, all other information being automatically furnished by the indications of the supervisory signals.

The line and supervisory signals used are very sensitive, and are of the gravity restoring type, a very prominent target being displayed at all times when there

INTERIOR VIEW.




LINK SIGNAL.



LINE JACK.

is battery current on the signal. This signal can be adjusted to various degrees of sensitiveness so that it can be made applicable to lines differing greatly in length. The manufacturers claim that all signals that go onto the board are adjusted to a sensitiveness permitting of their use on lines of several times the length possible with other makes of battery target signals.

The answering and multiple jacks are made of the very best German silver spring metal mounted in rubber, having mica insulation between the several springs and strips, and the whole mounted on an aluminum base, giving both strength and rigidity, and high insulation. All spring jacks, either answering or multiple, are platinum pointed, the points being riveted into the springs. This company claims that it uses absolutely pure platinum in all its contacts. The ringing and listening keys are of very efficient type, having full platinum points, all parts of the circuit being exposed to view on lifting the operator's table, so that testing and repairs are easily made.

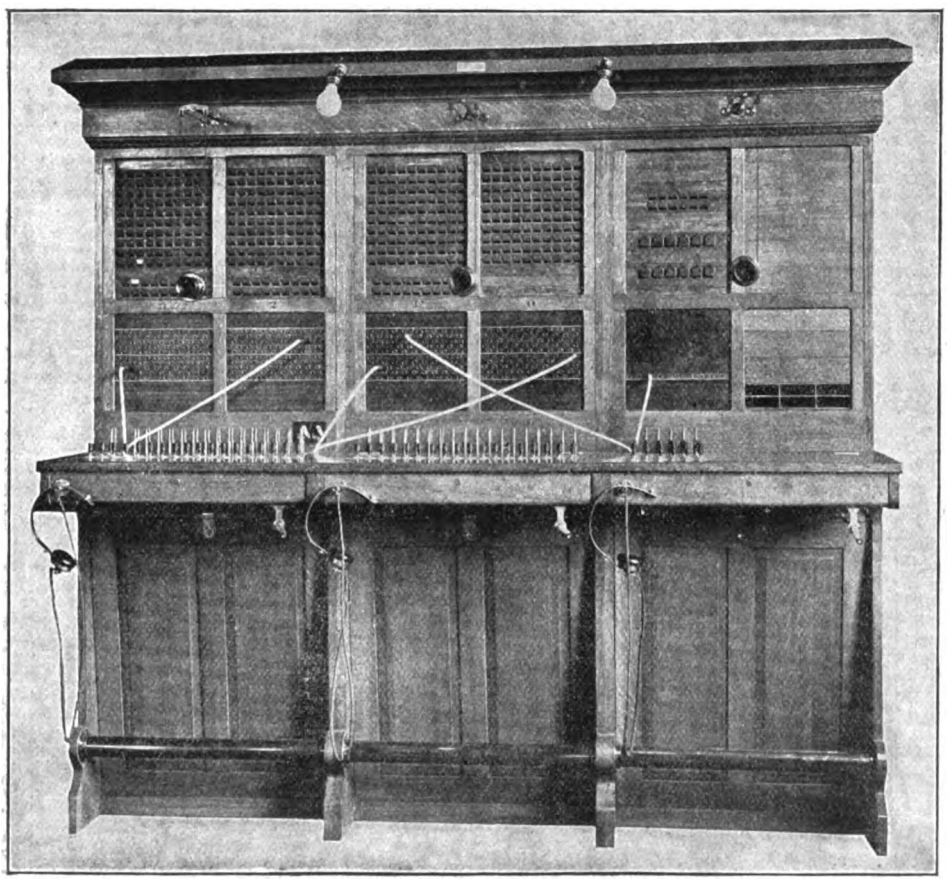
The instrument used at the subscriber's station is similar in the matter of equipment to that required on the ordinary magneto-call system, excepting that a generator is not used. This company has also designed a very desirable form of wall instrument which it claims is meeting with marked success. Especial care has been used in the construction of this instrument to provide all facilities

Digitized by Google

for inspection and making repairs easily and rapidly. Several very novel forms of special instruments, such as a corner cabinet set, desk set, combination set, etc., are applicable for use on this system.

The North Electric Company makes several important claims regarding "The Supervisory System." It claims that there is no centralized battery system offered having so small a battery consumption as there is in the regular operation of this system. In fact, it is perfectly practical in most exchanges to use ordinary closed circuit types of batteries. This is an important feature to be considered when making out estimates of the maintenance expense of an exchange.

A very neat and efficient power plant is furnished, having marble slab switchboard with meters, switches, bus-bars, etc., offering every facility for knowing at all times the actual conditions of the power plant and the amount of current used. It is further furnished with an alarm relay, giving an automatic signal at any time that an exceptional drain on the batteries occurs.



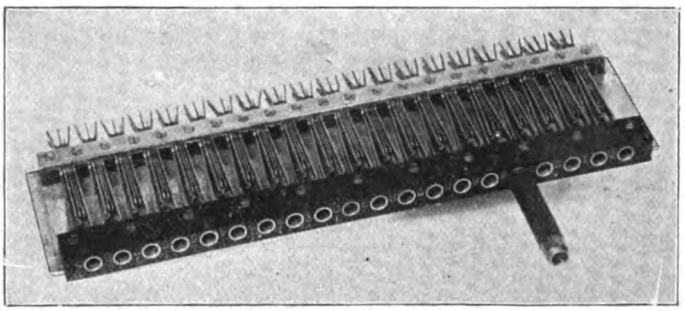
400 SIGNALS INSTALLED, AND TOLL SECTION.

The large reduction in the amount of labor on the part of the operators increases very materially the capacity of each operator, she being able to take care of, so it is claimed, from two to three times as many lines as is possible with the old style magneto-call type of system. As an example: the North Electric Company claims to be able to

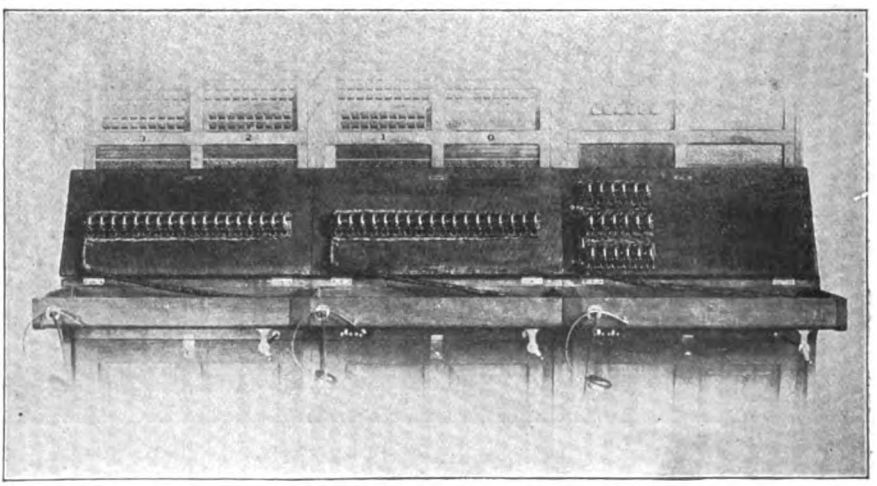
Digitized by Google

demonstrate the fact that in the case of a 1,000-line multiple supervisory system as compared with a magneto-call trunking system of the same size, the saving in operators' salaries alone will pay for the installation of a new central office equipment of the supervisory system in from two to three years, this depending entirely upon how busy the exchange is and the prices paid to operators. It claims that as to a comparison between a 1,000-line multiple supervisory system and a 1,000-line magneto-call multiple system, only one-half of the number of operators is required in the former. This company claims further that its supervisory system, as compared with any central battery system depending on one supervisory signal to each pair of cords, will show a very material advantage amounting to a saving of from one-third to one-half of the number of operators.

In the apparatus shown the switchboard is arranged for 400 lines, 200 lines to the operator, together with the toll-line section mounted on the same frame with the exchange switchboard. A glance at the view of the interior arrangement of the keyboard will show the method of mounting the lever switches, as well as the facilities offered to the toll-line operator for cutting in and out of circuit her ringing generator or repeating coil, or switching her own set, so that she can assist the other operators to answer calls at the time of an unexpected rush.



MULTIPLE JACK.



KEYBOARD ARRANGEMENT.

Digitized by Google

The North Electric Company claims that it also has this system with both talking and signaling batteries located at the central office. In the apparatus described the subscriber has local talking batteries at the telephone, utilizing the central signaling battery for the line and supervisory signaling work.

The North Electric Company will be glad to furnish any exchange desiring information on "The Supervisory System" with full data as to same covering its claims in full.

THE "WESTERN" TOLL-LINE BOARD.

## THE "WESTERN" TOLL-LINE BOARD.

Our illustration shows one of the combined chief operator's desk and toll-board made for the Delmarvia Telephone Company, of Wilmington, Delaware, by the Western Telephone Construction Company. It is a fine example of this company's high-grade line of apparatus. The Delmarvia Company is making extensive improvements and additions to its system, which is equipped thruout with "Western" apparatus. The Western Company is increasing that company's switchboard capacity from 1,200 to 1,500 lines.

Among some of the larger orders recently secured by the Western Company are two multiple board contracts, one for Pottsville, Pennsylvania, 800 lines, and another of 1,800 lines' capacity for Williamsport, Pennsylvania. These two exchanges are being equipped by the Western Telephone Construction Company with its latest Central Energy system.

---

"I AM very well pleased with it, and would not miss a single number, if possible to get them."

HARRY S. KRUM.

Digitized by Google

# Telephone Magazine

THE ONLY INDEPENDENT TELEPHONE PAPER IN THE WORLD.

MARQUETTE BUILDING,
TEL. CENTRAL 2641. CHICAGO.

Published on the 15th day of each month.

**Electrical Engineering Publishing Co.**

JOHN C. McMYNN, PRESIDENT.
C. E. KAMMEYER, EDITOR.

**SUBSCRIPTION:**

One year, United States and Canada..... $1.00
One year, foreign countries ..... 1.50
Single copies..... .10



**COPYRIGHT:**

The title and contents of this paper are covered by a general copyright. Permission from publishers must be obtained before any article or table is copied, or any illustration reproduced.


**CHICAGO, AUGUST 15, 1900.**

IN this issue of THE TELEPHONE MAGAZINE we reprint a description of the new Berlin multiple board in order to show to our readers at what stage of the art the Germans are at the present time. It is the policy of the German Government to cater to home talent, which in the case of telephony does not seem to have kept up with the times. Any American telephone engineer would be surprised to see at the end of this century a multiple board installed with the multiple jacks in series, and the old clearing-out drop in the cord circuit, keeping up the old-fashioned method of the operators annoying the subscribers by cutting in on the lines. It seems they do not know in the Fatherland common talking battery nor automatic calling, nor the two-lamp supervisory system, not mentioning the use of lamps for line signals, and many other devices which are in our minds essential to a modern telephone system.

The curiosity in the Berlin board is that all jacks are mounted in a horizontal table, the answering jacks being mounted in the cord shelf, and the multiple jacks upon a large platform, so that operators can plug into the multiple from both sides. The expediency of such a table board is doubtful, and is strictly avoided in this country. The strips of multiple jacks are provided with a double numbering, one row of figures facing the operator on one side and reading in the usual manner, the other row of figures facing the operator on the other side, but reading from right to left like Hebrew, which would not be objectionable if all the operators on this side were of Semitic extraction. Wherever there is a high rate of calls in an exchange and two operators are working from both sides on the same multiple a matting of cords is unavoidable. If the business in Berlin would be animated like the business in an American city, and if the Germans were not so conservative such a board would never be tolerated. In this case "Made in Germany" should be put on the board to classify it with the many other articles sailing under that flag.

## SUED FOR COMPETITION.

To what extreme measures the Central Union (Bell) Telephone Company will resort in its frantic endeavors to stem the tide of the Independent movement, is shown in the report of a controversy between the Central Union Telephone Company and the Bryan Telephone Company, of Bryan, Ohio, in the Bryan *Press* of July 19 last.

It seems that the Bryan Telephone Company, thru its superior service and reasonable rates, secured over three hundred subscribers in a town of less than 3,500 inhabitants, leaving the enemy with a little over a hundred adherents to its fast degenerating system, and for this, for engaging in legitimate competition, the Bryan Telephone Company was

Digitized by Google

served thru its officers, with notice of a suit for damages brought against it by the Central Union Telephone Company, in the United States Court, at Toledo. The damages asked, in the amount of $10,000, are alleged to have resulted to the Central Union Company by reason of the opposition against it here. It is claimed in the petition that the local company has secured plaintiff's patrons, and by persuasion, misrepresentation, threats and intimidation has succeeded in inducing them to remove plaintiff's instruments and abandon its service. A temporary injunction was also asked to restrain the local company from further prosecuting its work, but no restraining order has been issued.

The portion of the petition in which the plaintiff states its ground for damages is as follows :

Your orator says that at sundry times during the month of June, 1900, and before and since, said defendant, The Bryan Telephone Company, thru its said officers and agents, and thru other of its employes, called upon a large number of plaintiff's subscribers in the Village of Bryan, and by persuasion, misrepresentation, threats and intimidation, induced a large number of said subscribers to sign a printed form notice to plaintiff to discontinue its telephone service to said subscribers, and that on the 2d day of July, 1900, and before and since that day, said defendants, thru their employes, did enter into the dwellings, offices and places of business of many of said subscribers, and did forcibly, wrongfully and unlawfully interfere with the property of plaintiff, to-wit: its telephones, wires and other fixtures connecting said telephones with plaintiff's exchange in said village, and said defendants, thru their employes, did disconnect said telephones, break and cut said wires and remove the same from their proper position and fastenings, thereby injuring and destroying said property belonging to plaintiff, and cutting off said plaintiff's communication with its said subscribers, so that plaintiff was and still is unable to furnish telephone service between said subscribers and all other subscribers connected with plaintiff's said exchange, both within said Village of Bryan and plaintiff's numerous other exchanges located and operated in the various cities, towns and villages of said States of Ohio, Indiana and Illinois, and also with other parts of its connecting lines extending over and thru the territory herein described.

It appears to be the policy of the Bell Company, continues the *Press*, to allow its telephones to remain in the subscribers' residence, or place of business, regardless of the fact that they are ordered removed, and it is known to be a fact that in different instances service has been furnished to its subscribers in Bryan for different periods of time without any compensation to the telephone company.

This is undoubtedly the reason that the subscribers gave authority to the Bryan Telephone Company to disconnect the instruments after legal notice had been served on the Central Union Telephone Company to discontinue service and, by the terms of the contract, to terminate the same. In one or two instances where the notices to discontinue service were served, authority was not given the Bryan Company to remove the 'phones, and the Central Union Company has failed to remove the instruments to this day, altho nearly three weeks have elapsed since the service of the notice.

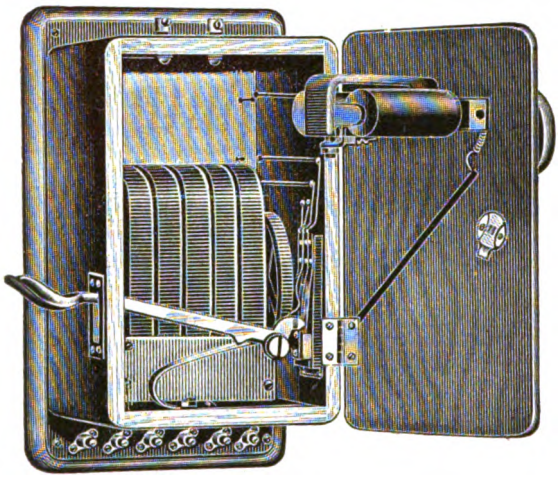
There is no doubt but that the Central Union Telephone Company has been seriously damaged in this town by reason of the discontinuing of service by so many of its important subscribers, but it is the same damage that results to any business by loss of patronage, and it seems foolish and puerile to try and blame a competitor for that loss. As long as business is carried on there will be competition and business men will solicit trade from their competitors' customers. This and this only has been done in Bryan, and the Bryan Telephone Company feels very confident that the Central Union Company will not be able to recover one cent of damages. In fact it is claimed that the suit has been brought for the purpose of trying to intimidate those who may not be cognizant of the true situation of affairs, and not with the thought that there is a chance to recover damages.

To give the public some idea of the condition of local service, it may be stated that Central Union subscribers are now unable to reach by their own connections any drug store, hardware, bank, the courthouse or jail, any icehouse, livery barn or meat market, while the Bryan Telephone Company has over three hundred subscribers, including almost every department of business, connected with its exchange.

Digitized by Google

## CHICAGO TELEPHONE SUPPLY COMPANY.

This company is one of the oldest of Independent factories, manufacturing everything that enters into the production of Chicago telephones, switchboards and parts. A visit to the factory discloses the fact that only modern methods and



CHICAGO BRIDGING MAGNETO.

machinery of the latest up-to-date type are employed, a force of tool-makers being constantly at work on new dies, tools and patterns to replace those worn and to give mechanical form to improvements suggested by the experimental department.

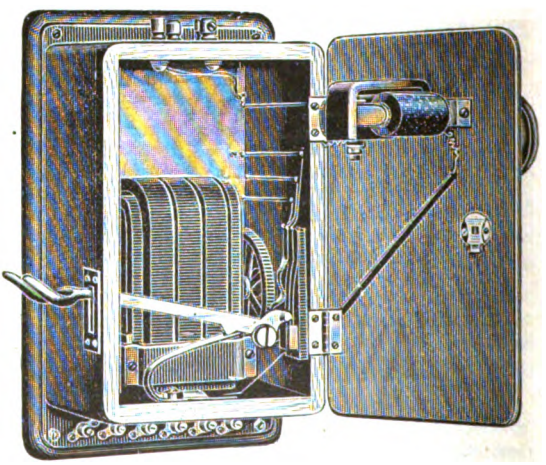
In the matter of adopting changes, that could by any possibility prove mere fads rather than improvements, the company has been very conservative. This policy has been a very expensive one in some respects, because every change suggested has to be severely and thoroly tested before it is adopted. It first has to be produced in the form of a model for factory tests. If these tests prove satisfactory special tools are made and a quantity of apparatus is made up for practical tests. The apparatus is then placed in actual service for a few months, and if further changes are necessary the test of actual service will demonstrate the fact.

If the test of service proves the factory or theoretical test, then the improvement becomes an integral part of Chicago apparatus. If the test of service disproves the factory test, or develops trouble points unforeseen by the experimental department, then all the work and material used in making the change is discarded.

The Chicago Telephone Supply Company takes especial pride in its magneto department. The production of a first-class bridging magneto, it claims, presents many difficulties in both theory and practice. So great are these difficulties, we are informed, that few of even the leading telephone factories are now manufacturing this important part of a telephone.

In the Chicago magnetos, bridging and series, is shown this factory's ability to solve the most difficult problems. The wonderful growth in the demand for Chicago apparatus is largely attributable to the superiority of Chicago magnetos, altho the Chicago express switchboard has also contributed its share in this respect.

There is, perhaps, no manufacturing industry that embraces such a mass of detail as the telephone business. This is an age of specialization, and every department must have a practical superintendent as well as a repre-



CHICAGO SERIES MAGNETO.

sentative in experimental and theoretical work. The company always welcomes visitors in the trade, and a visit to the factory will be an event worthy of consideration when in the city.

Digitized by Google

## SOME NEW EUREKA APPARATUS.

One of the latest productions of the well-known Eureka apparatus is a Eureka Metallic Express equipped for 1,000 capacity, with 500 lines installed and having Pilot Supervisory Visual Signals. The Eureka Company has installed several of these large boards quite lately, and the reports show the same general satisfaction that its smaller boards have in the past.

This company is now entering the field for large boards, and is furnishing systems for central energy work, either for local or centralized battery, Pilot Lamp Visual Signal operating in the transfer as well as in the line drops.

The Eureka Switchboard is claimed by the manufacturers to be the fastest operating board ever produced, one operator being able to handle double the number of subscribers over any board on the market. The operation is so rapid as to be almost instantaneous. This claim of the Eureka Company of the economy in operation, that is, one operator being able to handle double the number of subscribers of any other board, is sometimes overlooked in the purchase of apparatus. Some of the company's circulars illustrate and describe its high-grade line of telephones and switchboards, particularly its new switchboard, either for large or small exchanges, bridged or series tubular self-restoring flash-light and express switchboards.

In producing its new No. 1 Special Transmitter, the company intends to

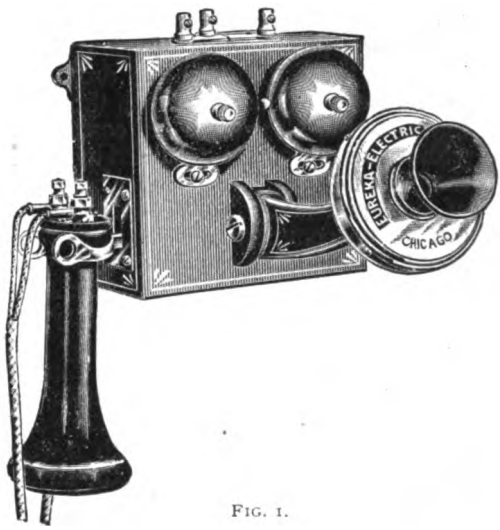



FIG. 1.

place on the market apparatus that will in every particular compete with the highest grade of service that may be furnished by the Bell monopoly. Instead of any stamping, all of the work is of heavy castings and engine-lathe turned.

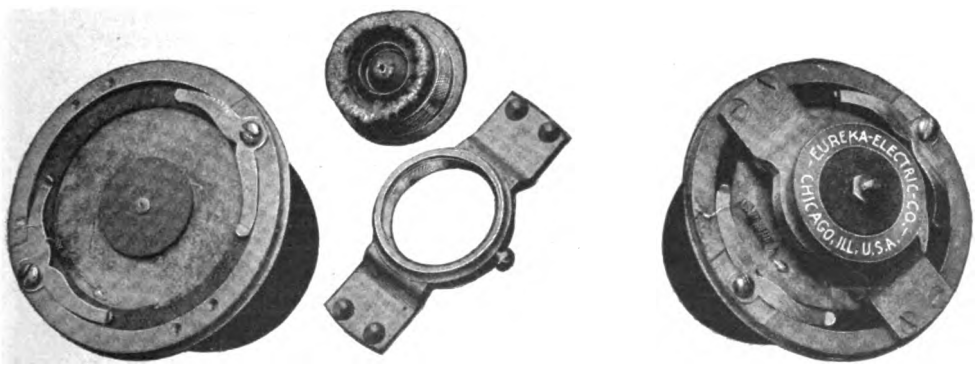



FIG. 2.

heavy-cast engine, lathe-turned transmitter and other high-grade specialties that they have entered in their line of apparatus within the last six months, and will be pleased to give fuller and further particulars on anything in that line, and particularly on the high-grade Transmitters of this construction reproduce articulation perfectly without any rasping, harsh sounds, and are specially adapted for long-line heavy work as well as for heavy exchange work.

In Fig. 1 is shown herewith the Eureka No. 1 Special Transmitter, also the

Digitized by Google

triplet set, while Fig. 2 shows the detail parts of the transmitter.

The Eureka Central Energy Telephone System can be installed in existing magneto systems, its features of merit being, first, the current is not kept upon the lines all the time — that is, only on the lines at the time of operation of the instrument, the removal of the receiver from the hook throwing the drop, and the replacing of the same upon the hook throwing the clear-out. In connection with its high-grade switchboard by using the pilot flash-light it has special points of merit and is capable of superior service. The company will be pleased to give full particulars regarding this apparatus. Its Central Energy Systems are equipped for either local battery or centralized battery.

In Fig. 3 is shown the new Eureka No. 33 Desk Telephone, which, on account of its handsome appearance and intrinsic merit, is meeting with a very large sale. The operation of the switch in this desk-set is an admirable device,

FIG. 3.

the spring being on the inside and not showing on the outside at all.

The Eureka Electric Company is also forwarding to Independent companies, free, gratis, a new name-plate sign to go on the front of the instruments. The design embraces the well-known Maltese Cross. The company will be pleased to mail or express as many of these name-plates as may be desired to any of the

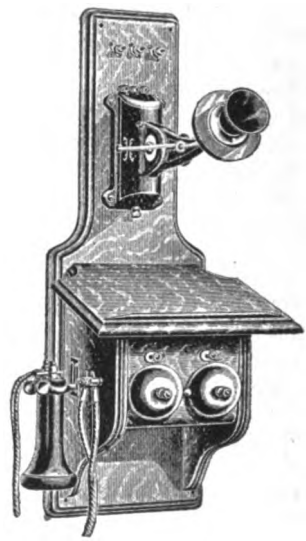


FIG. 4.

CENTRALIZED BATTERY TELEPHONE.

Independent companies in the field, for the purpose of attaching same to their telephones in their exchanges, so as to educate the general public to the use of the Independent system in opposition to the Blue Bell.

## LITERARY NOTE.

*Cassier's Magazine* for August has a number of articles of special interest to electrical engineers, such as :

Electric Cranes in German Harbors. Noteworthy Installations at Hamburg and Bremerhafen. With thirteen illustrations. By Louis J. Magee.

Openings for Mechanical Engineers in China. Railways, Electric Engineering, Mining and Manufactures. With eight illustrations. By Lord Charles Beresford.

The Manufacture of Light. The Problem of Efficient Production. By John Henderson, D.Sc., F.R.S.E.

Other valuable contributions are :

Hot-Water Heating In Industrial Works. A Means of Saving Waste Heat. By Alton D. Adams.

The Imperial Japanese Navy. Ships and Dock Yards of the New World Power. With ten illustrations. By Rear-Admiral C. C. P. Fitz Gerald, R. N.

Digitized by Google

## SOME NEW AMERICAN EXCHANGES.

Among the recent "Central Energy" sales by the American Company may be mentioned: Salem, Ohio, 400; Columbiana, Ohio, 200; East Liverpool, Ohio, 600. The following have the Express flash-light transfer: Newark, Ohio, 500; Adrian, Mich., 600; Frederick, Ind., 400, and a special toll-board and chief operator's desk combined. Huntington, W. Va., has a 500 Express flash-light transfer; Chanute, Kan., 300 Express flash-light transfer; Hiawatha, Kan., 300 Express board; Oskaloosa, Kan., 150 Express board; Mount Pleasant, Mich., 200 Bell style board; Vinton, Iowa, 100 Express and a special toll-board and chief operator's desk combined; Massachusetts Telephone & Telegraph Company, Boston, Mass., special toll-line board; full equipments of the Burns Central Office Cable terminals with heat coils and carbon lightning arresters were furnished with the majority of the above shipments.

This company is installing at Allentown, Pennsylvania, a 1,000-line multiple board with a full equipment of its up-to-date accessories, including Burns cable-heads and protectors, cross-connecting boards, and a power-board equipped with a full complement of measuring instruments and switches.

## A PERFECT SOLDERING FLUX.

With very few exceptions all the soldering salts, soldering sticks, compounds and other preparations heretofore placed upon the market had some defect, which prevented their satisfactory use for all classes of work in the electric light, telephone and other lines. Most of them contain some acid or other element injurious to electrical connections, which, in a short time, by its corrosive action, causes the joint to turn green, corrode and sometimes break or snap off. All soldering sticks are hard to apply, especially to small and delicate joints, and with soldering salts the workman must prepare his own solution. The rosin flux, used so extensively in telephone work, will not solder bare copper wire, and the connections have to be tinned before the joint can be made. Neither has there been, until now, a soldering flux which will solder all metals or a combination of metals. This, of course, includes aluminum, and this fact will, no doubt, bring that useful metal into more extended use.

Cream flux is the name given to this new preparation, which has none of the defects and all and more of the good qualities of the others. Its great economy is apparent from the fact that one pound of flux is equal to four gallons of solution. It is also easily applied, and, being in a pasty condition, there is nothing to spill or evaporate. Neither will it sputter when solder is applied. It is used in its present state, the heat causes the flux to go into every crevice of the joints, and the solder follows. Another valuable feature is that it will make perfect connections for the largest cable work or the finest telephone cord or electric light strand. Other compounds generally require so much heat that often a burnt connection is the result. The fact that in a 1,000-line modern multiple switchboard there are over 120,000 soldered connections, would seem to indicate the wide and extensive application which a perfect soldering flux will find.

---

VICTOR TELEPHONE WORKS, Chicago, reports recent shipments of apparatus to some thirty different places. Mr. H. C. Dodge, manager, mentions the following: Malvern, Iowa, 100-drop switchboard and telephones; Manhattan, Ill., 100-drop switchboard and telephones; Cameron, Ill., combined exchange and toll-line switchboard and bridging bell telephones; Winchester, Ky., toll-line switchboard; Vergennes, Vt., exchange switchboard and telephones; Campbellsville, Ky., 100-drop exchange equipment and telephones; Dublin, Va., combined exchange and toll-line switchboard; Tiplersville, Miss., 100-drop central office equipment and telephones; Claridon, Ohio, 100-drop switchboard and telephones; Waterloo, Mich., 100-drop switchboard and telephones; Aurora, Mo., 200-drop central station equipment; Booneville, N. Y., 100-drop switchboard, central office equipment and telephones.

Digitized by Google

## POLE LINE SPECIFICATIONS

### OF THE FEDERAL TELEPHONE COMPANY, OF PITTSBURG, PENNSYLVANIA, FOR USE WHEN CONTRACTING FOR THE CONSTRUCTION OF TELEPHONE TRUNK OR TOLL LINES.

(*Concluded.*)

The Y form of guy shall be adopted on all straight lines wherever three or more cross-arms are used, and on all curves, corners and on terminal poles. One end of the steel guy strand shall be wrapped twice around the pole just above the top cross-arm, and be stapled and clamped, while the other end is drawn thru the eye of the anchor-rod and tightly clamped. One end of a second length of guy strand is then wrapped twice around the pole just below the lower cross-arm, stapled and clamped, and the other end is intertwined with and clamped to the main guy strand. When only one cross-arm is used the guy shall be attached under the second gain; with two cross-arms, above the second gain.

The contractor shall so place the guys required on straight lines that should the vertical stress exerted on one pole, due to the direct load resulting from an excessive accumulation of sleet or snow, result in crushing the pole, or an excessive lateral stress, due to a gale of wind swaying the wires, snap a pole, then only the section of circuits for a distance of one or two poles on each side of the broken pole shall be affected, and that the remaining poles shall be able to withstand the stresses entailed in carrying the increased load. At all changes in the direction of a line, and where there are corner poles, and where there are terminal poles, the contractor shall not only provide an ample factor of safety as outlined above, but shall carefully observe that the poles selected and located at these points are of sufficient strength and are so suitably braced or guyed as to withstand under all ordinary conditions the bending-stress due to the tendency of the line-wires or cables to pull the pole sidewise; also to the bending-moment likely to arise and due to the sum of all tensions exerted by all wire or cable circuits, and which tend to pull the pole over in the direction of the line. When pole braces are used the brace should be fastened to the pole at a point just below the lowest gain, and held to the pole by two 10-penny nails and by five wraps of No. 6 galvanized iron wire.

All wire used for toll lines and for subscribers' circuits shall be equal in conductivity and tensile strength to Roebling's best hard-drawn copper telephone wire and shall conform to the standard specifications in all respects. The wire in each coil shall be drawn in one continuous length, be free from factory joints, scales, inequalities, flaws, splints, and all other imperfections, and so protected by wrappings of burlap that the surface of the wire will not be injured or mechanically bruised prior to being uncoiled.

For toll-line circuits hard-drawn copper wire of No. 12 B. & S. gauge shall be used. For subscriber circuits hard-drawn copper wire of No. 14 B. & S. gauge shall be used. All tie wires used shall be cut from No. 12 B. & S. soft-drawn copper wire, and shall be nineteen inches in length.

All wires shall be so strung as to allow for the normal expansion and contraction likely to occur under severe and sudden atmospheric changes, in accordance with the standard allowance for length of spans and the following table showing sag expressed in inches:

AMOUNT OF SAG IN SPANS.

| Temp. in Degs. Fahr. | SPANS, IN FEET. | | | | | |
|---|---|---|---|---|---|---|
| | 75 | 100 | 115 | 130 | 150 | 200 |
| | SAG, IN INCHES. | | | | | |
| 30 | 1 | 2 | 2½ | 3⅜ | 4½ | 8 |
| 10 | 1¼ | 2¼ | 3 | 3¾ | 5 | 9 |
| 10 | 1½ | 2⅝ | 3½ | 4⅜ | 5¾ | 10¼ |
| 30 | 1¾ | 3 | 4 | 5⅛ | 6¾ | 12 |
| 60 | 2½ | 4¼ | 5½ | 7 | 9 | 15⅜ |
| 80 | 3⅛ | 5⅜ | 7 | 8⅝ | 11¼ | 18¾ |
| 100 | 4¼ | 7 | 9 | 11 | 14 | 22¼ |

In stringing circuits the line wire shall be placed in the groove of the insulators assigned to that circuit and be tied thereto by a soft-drawn copper tie wire. In tying the line wire the tie wire shall be looped around the groove in the insulator and one end of the tie wire then passed under and over the line

Digitized by Google

wire, while the other end is passed over and under the line wire, each end being given five tightly drawn twists.

At every point where the line changes direction the line wire shall be bent in the groove of the insulator to such an angle as will insure its remaining in the groove and further insure that the strain shall be evenly distributed. Wherever the line ends dead a one-half sleeve shall be used to fasten the dead end to the wire, giving the sleeve one and one-half turns after the dead end is slipped in and leaving two inches opening between pole and sleeve.

On lines built parallel to street railway lines and in noisy sections of the country, the contractor shall transpose the wires at distances of every 1,000 feet, or at less distances should circumstances render such action necessary. Where there is but slight likelihood of disturbances, the wires shall be transposed every 2,000 feet or 3,000 feet, depending on the character of the disturbing cause. The contractor shall follow the standard method of transposition, and have each wire or side of each circuit equally spaced between and equally distant from the cause.

Where these toll lines cross private property, or are built along country roads on which neither electric light nor street railway poles have been erected, there shall be attached to each tenth pole, before the pole is erected, a lightning rod made of No. 6 galvanized iron wire. This wire shall extend from the top of the pole to the butt and then be coiled twice around the bottom of the pole, and it shall be fastened to the pole with 2-inch galvanized steel staples driven two feet apart.

On the delivery of each new lot of galvanized material a sample piece shall be selected from each package and then immersed in a saturated solution of blue vitriol (sulphate of copper), for full sixty seconds and then wiped dry, for three consecutive times. It shall then be immersed a fourth time, and should a copper deposit appear on the piece tested, or if the galvanizing disappears or scales, then all the pieces in the package from which the piece tested was taken shall be rejected.

In securing the right of way the owner of private property grants the right to the telephone company to clear away all brush and cut down all trees close to the ground so as to leave a clear space twenty feet in width, that is, for ten feet on each side of the center of the indicated course of the pole line. This often necessitates the chopping off of overhanging branches on trees that are not standing within the prescribed twenty feet, in order that these branches shall not sway against the outer wires. Should the owner seriously object to all the trimming outlined then the contractor shall trim the overhanging branches on each side of the right of way space in accordance with the requirements and instructions of the inspector given in each case.

Within forty-eight hours after cutting same the contractor shall remove all brush, trees, trimmings and debris of every character to such point on the property as the owner may direct, or, if the owner prefers, the contractor shall pile and burn all the cuttings at convenient points along the right of way. If the owner is indifferent to the disposition made of these cuttings then the contractor shall remove same to the nearest point where they will in no way interfere with the subsequent erection of the poles or the stringing of the wires. The contractor alone shall be responsible for all damages resulting directly or indirectly from the cutting of brush or trees, the falling of trees, the burning of same, or removal or depositing of same, and the contractor alone shall be responsible for any and all damages or claims for damages arising from or thru any action of his employes.

---

CROSS FORK, PA.—The Cross Fork, Germania and Galeton Telephone Association, recently organized to build a telephone line connecting the places named, has applied for a charter under the Pennsylvania laws. E. Peltz, of Cross Forks, is president of the new company, and Martin Groman, of the same place, is secretary. The company is capitalized at $3,000, all of which has been subscribed.

Digitized by Google

# MONTHLY DIGEST OF TELEPHONE AND KINDRED PATENTS

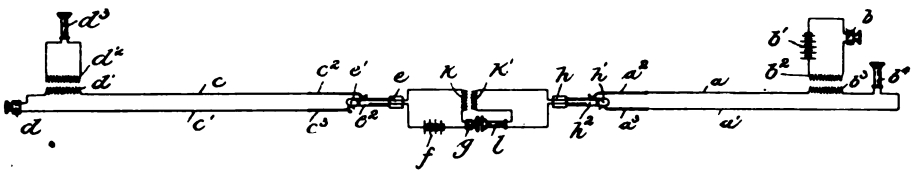
EDITED BY EDWARD E. CLEMENT.

Copies may be had, postage paid, by enclosing 10 cents for each one. Address inquiries in care of this magazine or to McGill building, Washington, D. C.

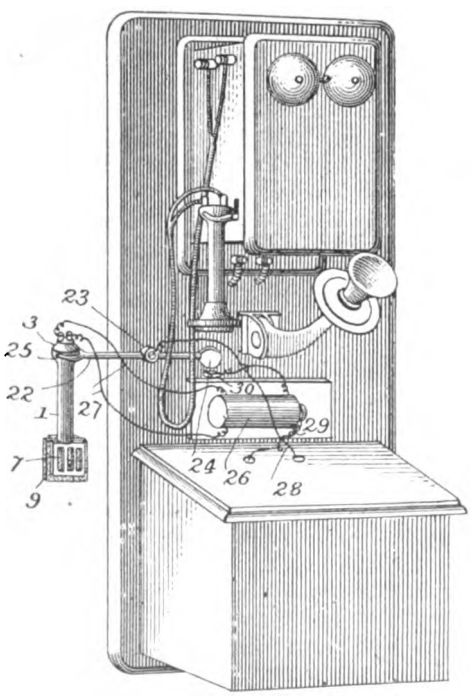
*July 3, 1900.*

No. 11,837 (REISSUE.)—W. M. DAVIS. TELEPHONE REPEATER.

This is a system primarily intended for uniting lines of different character, such as a very long line and a very short line, an ordinary line and a toll line, a magneto line and one provided with central energy, etc. The last-named case is illustrated in the figure. Here *a a'* is a line connecting a central office with a subscriber's station provided with the local battery *b'*; while *c c'* is a line having central supply and its subscriber's receiver in a local circuit, the transmitter being in the line. The invention lies in the plug-cord circuit *e h* connecting these lines. This circuit is not continuous, but is inductively connected into one circuit by the coil *k k'*. The receiver *l* included in the same side as the coil *k'* affects a transmitter *g* to repeat undulations in the circuit *a a'* into the other circuit *c c'*. Contrary repetition from circuit *c c'* into circuit *a a'* is by induction thru the coils *k k'*.



11,837. TELEPHONE REPEATER.




652,745. DEVICE FOR CLEANING TELEPHONE MOUTHPIECES.

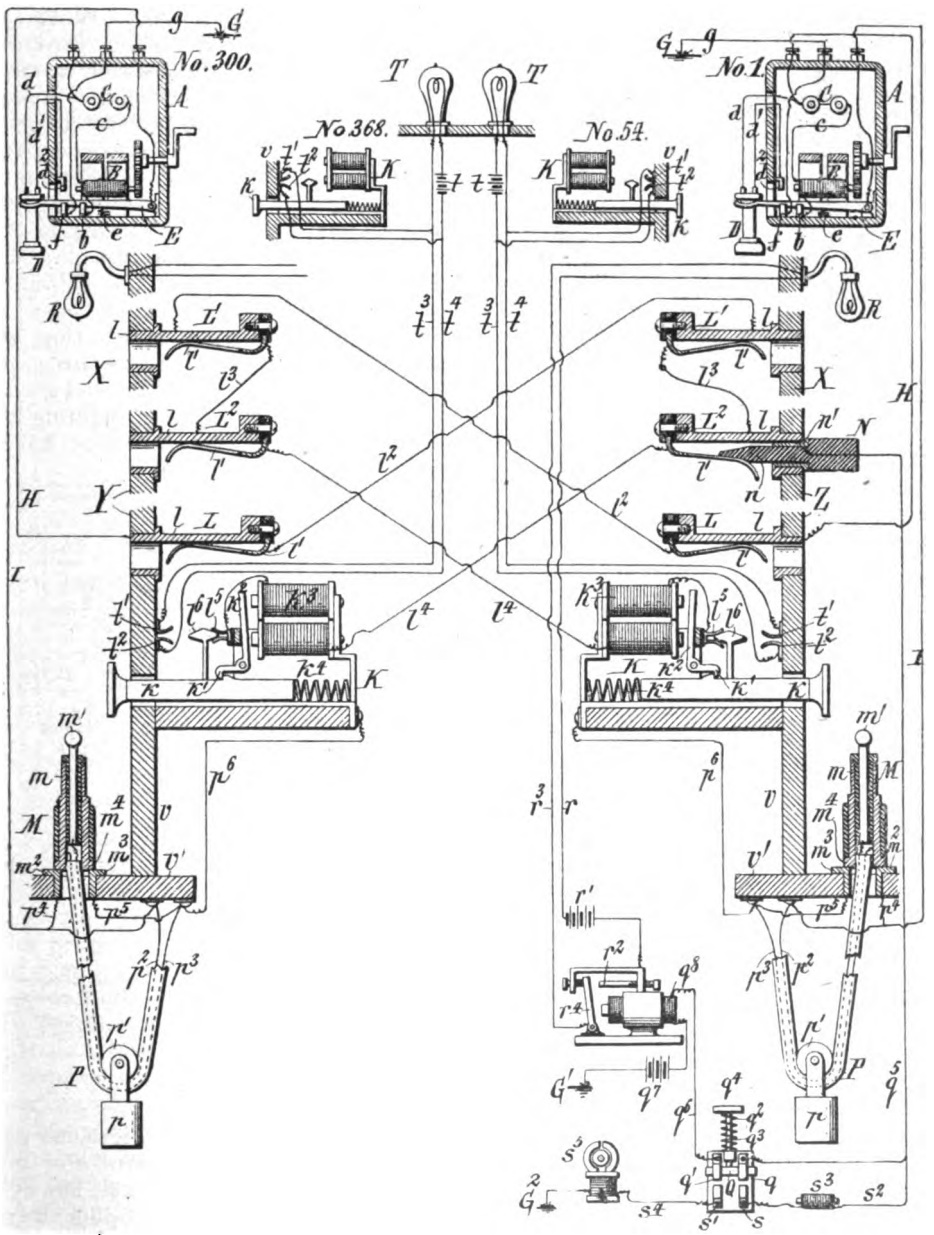
No. 652,745.—M. N. CLARKE. DEVICE FOR CLEANING TELEPHONE MOUTHPIECES.

This consists of a hollow handle 1, having a two-pronged metal end and a piece of felt 9 inserted between the prongs 7. The handle is filled with an antiseptic liquid, which flows down thru a small hole to saturate the felt. The cap of the handle carries terminals connected to the prongs 7, having conductors leading to the secondary of an inductorium 26, the primary of which is in a local circuit opened or closed by the switch hook 23. Ordinarily the microbe destroyer is hung up on its hook 23, keeping the local circuit of the coil open. When taken down, however, the local circuit is closed and an induced secondary current traverses the felt 9. The instrument is then used like an ordinary swab to clean out the mouthpiece, such microbes as escape death by the germicide solution being promptly despatched by the effects of the current.

Digitized by Google

No. 652,922.— O. PLUMMER AND C. E. MONROE. TELEPHONE SWITCH.

This is a switchboard for intercommunicating telephones. Each incoming line wire has its own terminals, as 16, adapted to coöperate with the bus-bars 17, of the home circuit. There is a push-button for each set of line terminals, so that by pushing button No. 1 connection is obtained with line No. 1, etc. Over each row of buttons is a detent 19, so arranged that when a button is pushed in, a head 18 will catch on the detent and hold the button in. Any number of



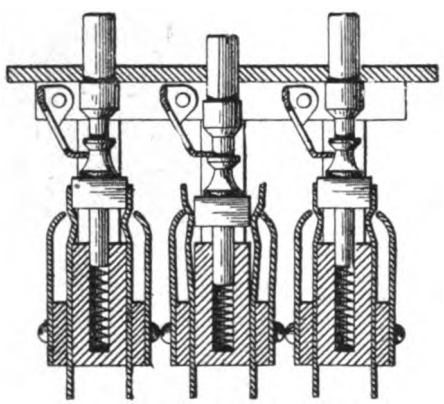

652,928. TELEPHONE EXCHANGE SYSTEM.

Digitized by Google

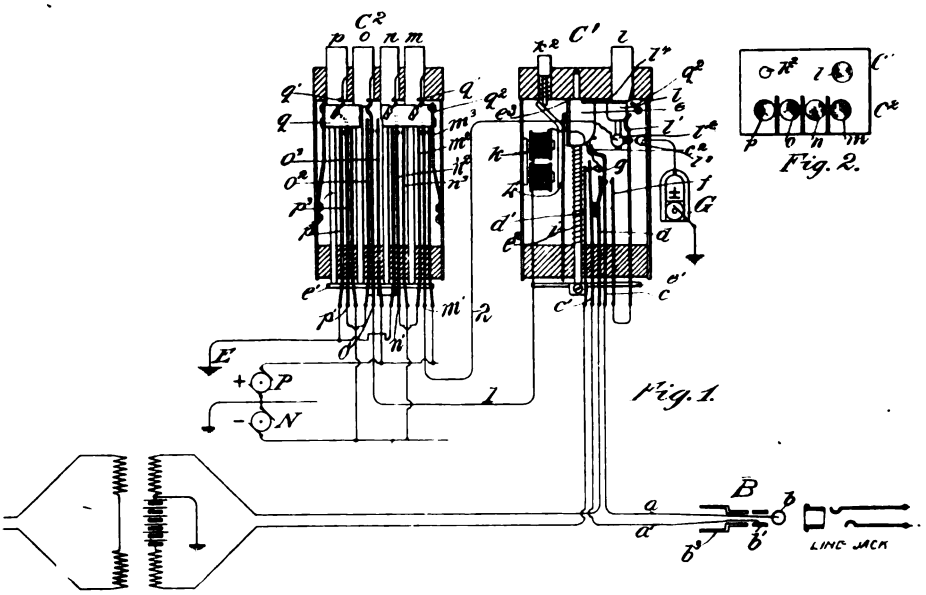
buttons may be thus pushed in until one of them is pushed to the limit, when a second cam or head 20 will lift the detent and permit retraction.

No. 652,928.—W. SMITH. TELEPHONE EXCHANGE SYSTEM.

This is a multiple-board system having a rather complicated sequence of operations, but simple in the principles involved. The subscriber's station, shown at A, has a ground tap connected to line when the hook switch E is down. The line H comes in to central, and after connecting to answering jack L is continued thru the multiple jacks $L^1$ and $L^2$ in series, to the line annunciator magnet $k^3$, thru normally closed plunger contacts $l^5$ and $l^6$ to wire $p^6$, to contacts in seat of plug M, normally bridged by heel of plug, and so out by line wire I. The plug M is connected into this circuit so that when it is lifted from its seat it is connected across the break in the seat. When subscriber operates his calling generator current passes thru the metallic circuit to energize magnet $k^3$, and release plunger $k$, the latter then breaking the circuit at $l^5$ $l^6$. The operator inserts an independent plug connected to her head set in the answering jack L, and simultaneously restores plunger $k$. Ascertaining the number wanted, separate test plug N is applied to the multiple jack of wanted line; and if the latter is not busy the wanted subscriber's ground being still connected as shown, current from test battery $q^7$ will flow out to line and ground and energize test relay $q^8$, lighting test lamp R on the board. Operator, having thus found line clear, takes terminal plug M of calling line and inserts it in multiple jack of wanted line, first, however, pressing down key $q^4$ in test-plug circuit, to ring. Ringing current passes around



652,922. TELEPHONE SWITCH.




652,977. SIGNALING APPARATUS FOR SWITCHBOARDS.

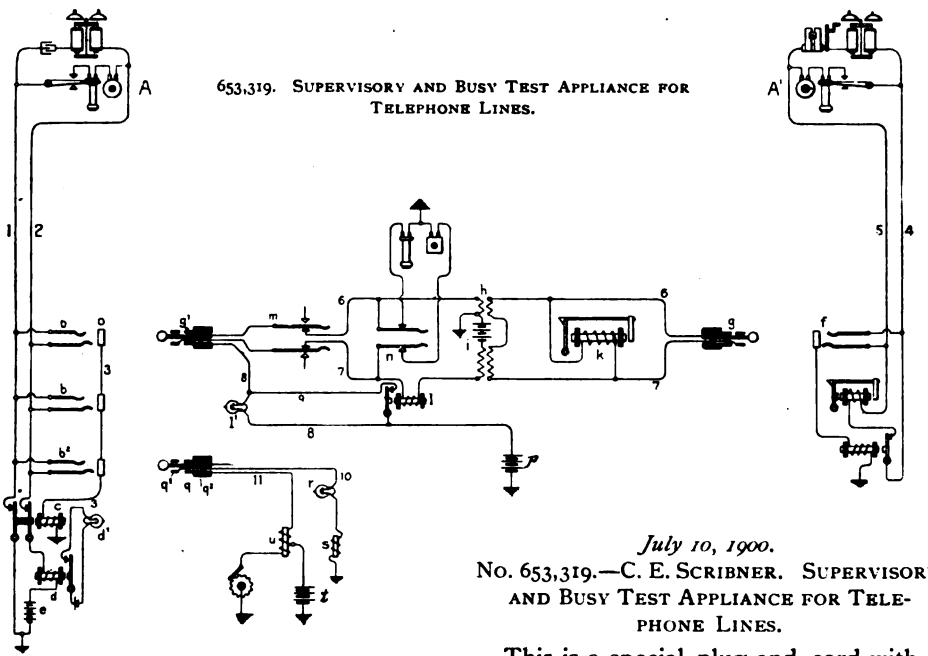
Digitized by Google

the line annunciator, and when subscribers ring off only the annunciator of the calling line responds. Talking current finds circuit thru both line annunciators in series.

No. 652,977.—J. J. O'CONNELL. SIGNALING APPARATUS FOR TELEPHONE SWITCHBOARDS.

This is a ringing key for calling out selectively over party lines, where the latter have polarized grounded bells connected to opposite sides of line. In such cases current of plus polarity on one side of line will ring one bell, that of minus another, and plus and minus currents on the opposite side of line will ring the remaining two respectively. The problem is to arrange keys so that the operator connects generator in proper relation to the proper side of line by simply pressing a button. In the figure five buttons are provided, shown in separate structures, but in reality all connected mechanically. Button $l$ when depressed pushes spring $l^1$ over against contact $l^3$ of an alternating current generator, and also carries down cam $e$ to push springs $c$ and $c^1$ over against contacts $g$ and $f$ respectively. On tracing the circuits carefully thruout it will be found that this simply connects generator G to the calling plug B to ring polarized ringers in the ordinary way. Now, if any of the other buttons $m$, $n$, $o$, or $p$, is depressed, the springs $m^1$, $n^1$, $o^1$, or $p^1$ are moved into proper relation with those $m^2$, $n^2$, $o^2$, $p^2$, etc., to bring generators P or N into connection with one side or the other of the cord circuit $a$ $a^1$, so as to send plus or minus current out. The depression of any button $m$, $n$, $o$, or $p$, also carries down cam $e$, by reason of stems resting on plate $e^1$ which is connected to cam $e$.

653,319. SUPERVISORY AND BUSY TEST APPLIANCE FOR TELEPHONE LINES.



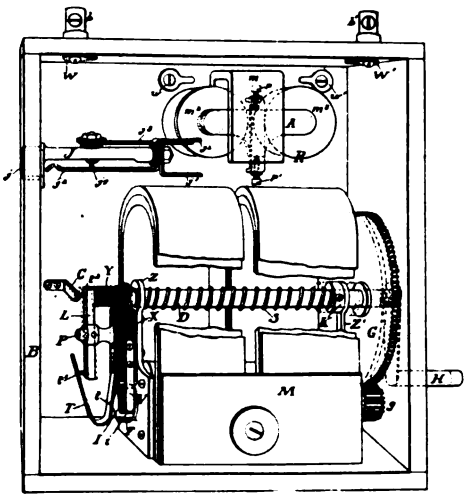

*July 10, 1900.*

No. 653,319.—C. E. SCRIBNER. SUPERVISORY AND BUSY TEST APPLIANCE FOR TELEPHONE LINES.

This is a special plug and cord with a test battery and circuit breaker, and a supervisory lamp $r$, adapted to be connected to a line while the answering operator is holding it busy for the toll board operator to complete a connection with a toll line. The answering operator gets the number wanted and passes it to the toll recording operator, then inserts plug $q$ in place of her answering plug, and turns to other matter. Current from battery $t$ flows to cut off relay $c$, and the circuit breaker shown causes a varying electromotive force to be impressed on the test circuits, so that any other operator touching a test ring $o$ hears a sound quite distinct from the

Digitized by Google

ordinary sound, this indicating that the line is held for a toll connection. When the toll operator finally completes the connection, current from her cord battery *i* flows thru wires 7, 2 and 10, to

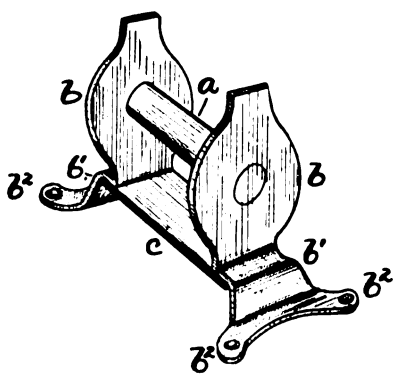


653,422. TELEPHONE TEST SET.

and thru the lamp *r*, indicating to the subscriber's operator that the plug *q* may be withdrawn.

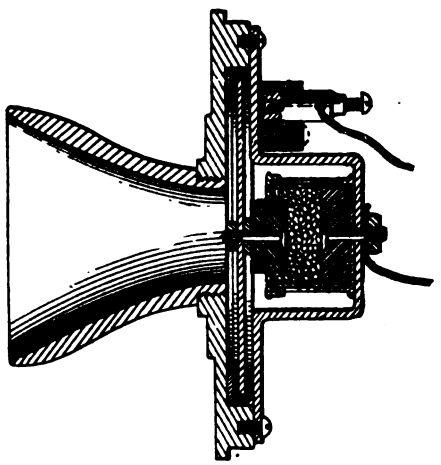
No. 653,422.—A. C. LUDINGTON TELEPHONE TEST SET.

This is a lineman's test box containing a generator, polarized buzzer or vibrator, and a spring jack. The lineman carries



32,953. FRAME FOR TELEPHONE CALLS.

a receiver connected to a plug adapted to be placed in the jack, and thereby connected to line. The generator handle has a reciprocating movement, being normally held out by a spring *s*. When pushed in and turned direct current is sent to line, but when turned without pushing in, alternating current goes out. This is accomplished by a commutator F on the armature shaft, having one segment, a coöperating spring brush to take off current of one polarity only; another brush bearing on the end of the shaft to take off current of both polarities; and a switch L worked by the shaft, to connect or disconnect the latter brush T. By means of this device a line may clip onto lines and test both ways without cutting, the alternating current throwing the switchboard drop and ringing the subscriber's bell, while the direct current throws the drop alone.



653,721. TELEPHONE TRANSMITTER.

*July 17, 1900.*

No. 32,953.—J. A. WILLIAMS. DESIGNS FOR FRAME FOR TELEPHONE CALLS.

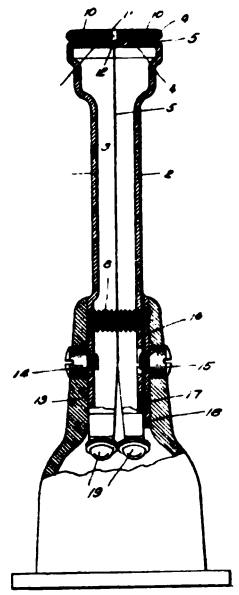
This is a design for ringer coil frame, heads and core, arranged specifically as shown.

No. 653,721.—J. S. WEST. TELEPHONE TRANSMITTER.

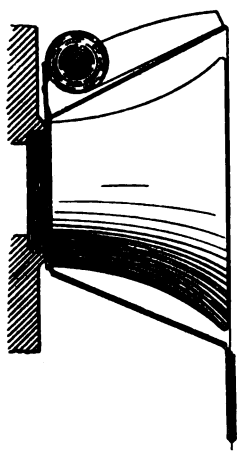
This is a granular transmitter of the white solid back type—having a front plate 5, carrying the diaphragm 7, and a bridge 17, carrying the chamber or box 40, which has the back electrode bolted against its bottom, and has a cover with an orifice large enough to admit the front electrode. There are openings in the

Digitized by Google

sides of the box, covered with mica, and the orifice in the front cover has a mica washer around it to bear on the electrode and confine the granules.



653,730. TRANSMITTER ARM.



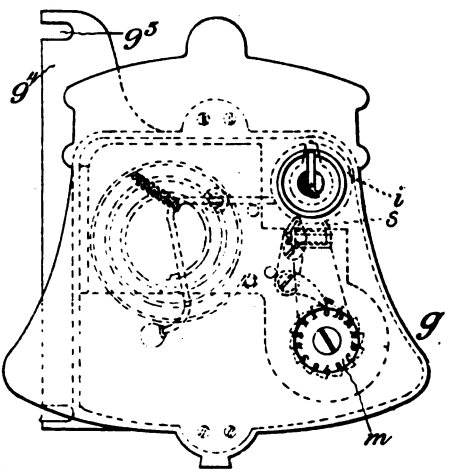
654,096. HYGIENIC APPLIANCE FOR MOUTHPIECE.

No. 653,730.—J. F. CRAVEN. TELEPHONE TRANSMITTER ARM.

This is an arm formed of two hollow stampings put together and secured by fiber screws 8 and 10. The two parts are insulated from each other at their edges by mica, japan or other material, and one pivot screw 15 takes into an insulated plate 16, while a fiber end plate 9 cores the transmitter end. Each half has a binding post 19, and the two halves form the conductors for the transmitter, without wires.

No. 654,096.—T. R. OWEN. HYGIENIC APPLIANCE FOR SOUND TRANSMITTER MOUTHPIECES.

This consists of a metal frame 8, held on the front of a transmitter by the mouthpiece being screwed down on it, and carrying a roll of paper which is guided across the opening of the mouthpiece, as shown, to keep out germs. Each user pulls down a fresh surface and talks thru the paper.



654,112. TELEPHONE CALL REGISTER.

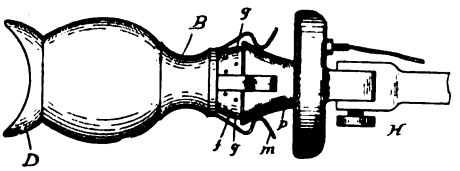
*July 17, 1900.*

No. 654,112.—W. GRAY. TELEPHONE CALL REGISTER.

This is a mechanical register for attachment to a subscriber's instrument, the frame of the register being metal adapted to be directly attached to the metal parts of the telephone instrument, whereby the sound of a gong in the register affects the transmitter to convey the sound to the listening operator at the central office. In the figure $g^4$ is the metal frame adapted to be clamped by fastening bolts thru the opening $g^5$ to the coil box; the spring gong shown in dotted line is secured to the metal frame, and its hammer has an arm projecting to the right

Digitized by Google

into the path of a fin turned by a key inserted at *i*. The same fin at each revolution turns the moving part of a small cylindrical cyclometer located behind the key barrel at *i*. Below the key barrel is



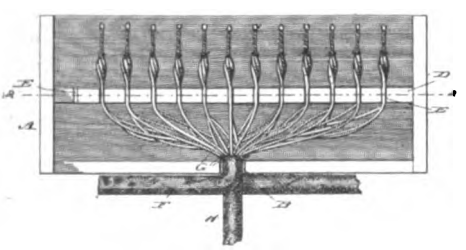

654,326. VOICE-CONCEALING ATTACHMENT.

a pivoted dog shown in dotted lines which, at each revolution of the key, throws the pawl shown to the right to turn a small ratchet wheel on whose face are figures visible from the front of the register. Each call is, therefore, indicated visually to the user, while a record of all calls up to several thousand is made within the instrument.

*July 24, 1900.*

No. 654,326.— H. P. ROBERTS. VOICE-CONCEALING ATTACHMENT FOR TELEPHONES.

This consists of two soft rubber bulbs, the smaller of which is perforated at *g*,



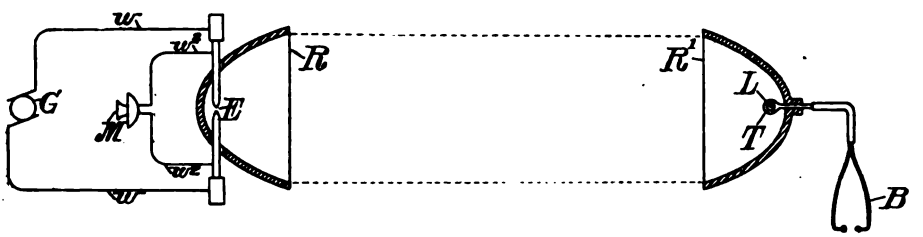
654,703. MEANS FOR CONNECTING CABLES.

and is of a size to fit within the transmitter mouthpiece, and the larger of which has a mouthpiece D to receive the lips of the user. B is a hard rubber connecting tube, and within the soft rubber bulb are hard rubber or metal deflections.

*July 31, 1900.*

No. 654,630.— H. V. HAYES AND E. R. CRAM. RADIOPHONY.

This invention consists of means for varying the amount of radiant energy thrown off by a given source in accordance with a code of signals or the vibrations of the human voice. A suitable receiver is supplied which responds to the variations in the radiant energy to reproduce the sounds or signals. In the form shown E is the arc of an electric arc lamp, arranged at the focal point of a parabolic reflector R, the energy for the arc being supplied by a generator G, and a microphone M being so connected as to shunt the same. The receiver consists of a substance very sensitive to heat, such as burnt cork, inclosed in a




654,630. RADIOPHONY.

glass tube T. When the transmitter M is used it produces changes in the current passing thru the arc lamp, and these changes are reproduced in the flow of radiant energy. The waves being thrown off in parallel lines by the parabolic reflector R are concentrated by the other reflector R′ upon the sensitive material L, which reproduces the sounds in the auditory tubes B. Instead of the substance L a selenium rheostat may be used, whose resistance changes with changes in light falling upon it, thus affecting the battery flow in a local circuit.

No. 654,703.— N. BASSETT. MEANS FOR CONNECTING CABLES.

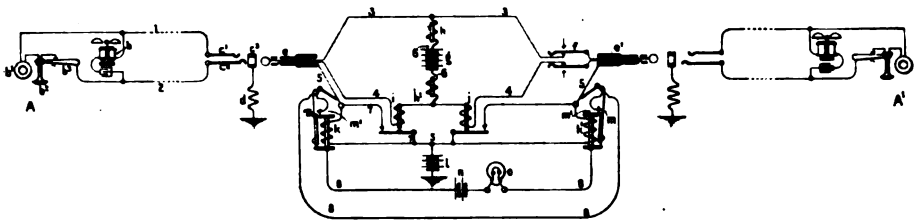
As shown in the diagram, this consists of a box A, with a partition B, having slots E in which the wire ends are laid,

Digitized by Google

all those ends which are to be connected being laid in the same slot and then twisted together.

No. 654,747.—F. R. McBERTY. SUPERVISORY SIGNAL FOR TELEPHONE SWITCHBOARD.

This is intended to be applied to the systems of the well-known common battery type employed by the American Bell Telephone Company, wherein there

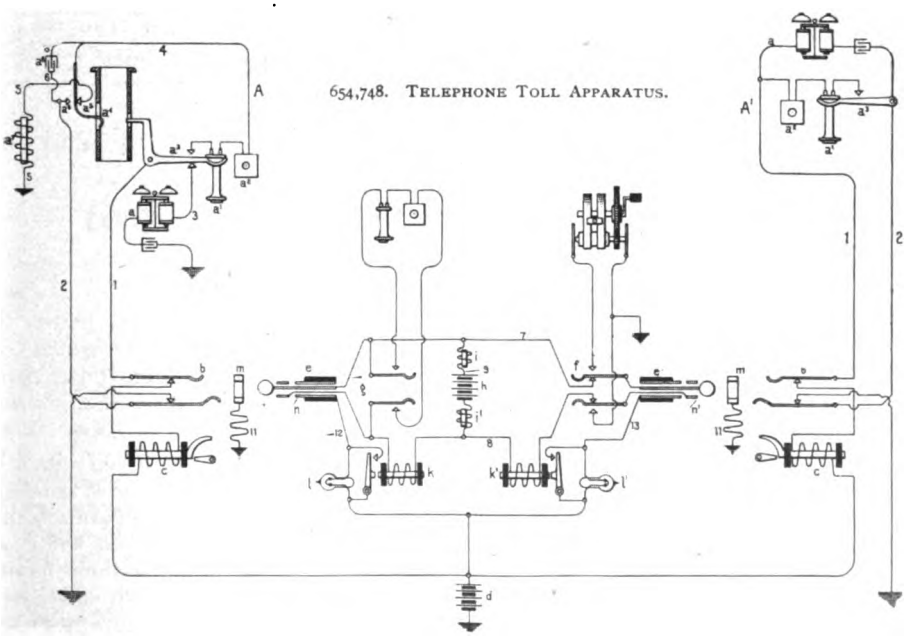


654,747. SUPERVISORY SIGNAL FOR TELEPHONE SWITCHBOARDS.

is a bridged battery *g* in the cord circuit which maintains a constant flow of current in the metallic circuit of each subscriber during the use of the line. If either subscriber hangs up he cuts off this current from his line and thereby causes the deënergization of his relay *i*, which thereupon breaks a shunt 7 about his supervisory signal *k*, and permits the same to be exhibited by current passing thru it from battery *l* thru the conductor 5 and resistance *v* to ground. When both these signals are exhibited it means that both subscribers have hung up, and in the present case a pilot lamp *o* is provided in local circuit 8, which circuit passes thru contact *m m'* on the two supervisory signal relays, in series; so that when both relays are excited the lamp *o* will be lighted to clear out.

No. 654,748.—F. R. McBERTY. TELEPHONE TOLL APPARATUS.

This is a toll-station signaling appara-



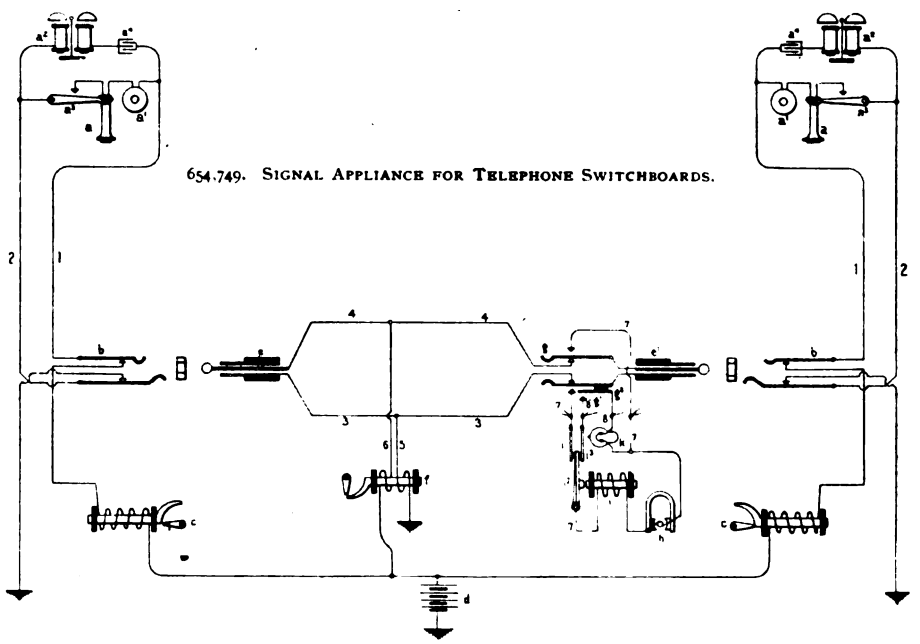
654,748. TELEPHONE TOLL APPARATUS.

tus for use on common battery lines. The circuits at central are those of the well-known bridged battery type of the

Digitized by Google

American Telephone Company, the battery *h* in the cord serving to furnish current for the subscribers' transmitters, and also to operate the supervisory relays *k k'*. At the subscriber's station the line wires terminate, one in the switch hook, by which it is normally grounded thru the ringer, and the other in a contact $a^6$, from which the wires 4 and 6 lead to the talking set thru the condenser $a^8$. The hook has a crank arm extending into a slot in the side of the coin chute, and a spring $a^5$ connected to wire 4 extends into a similar slot on the opposite side. This spring normally rests on a contact conforces the spring $a^5$ away from its contact and onto the other contact $a^6$, where it remains during the conversation. This closes a circuit around the condenser and allows battery current to pass, whereupon the relay *k* is energized to shunt the lamp *l* and extinguish the same, thereby indicating to the operator that the coin has been deposited.

A similar device for a register, in which the register push-button takes the place of the coin and is restored when the receiver is hung up, is also described. In the coin case the coin is of course permitted to drop when the receiver is hung up.



654,749. SIGNAL APPLIANCE FOR TELEPHONE SWITCHBOARDS.

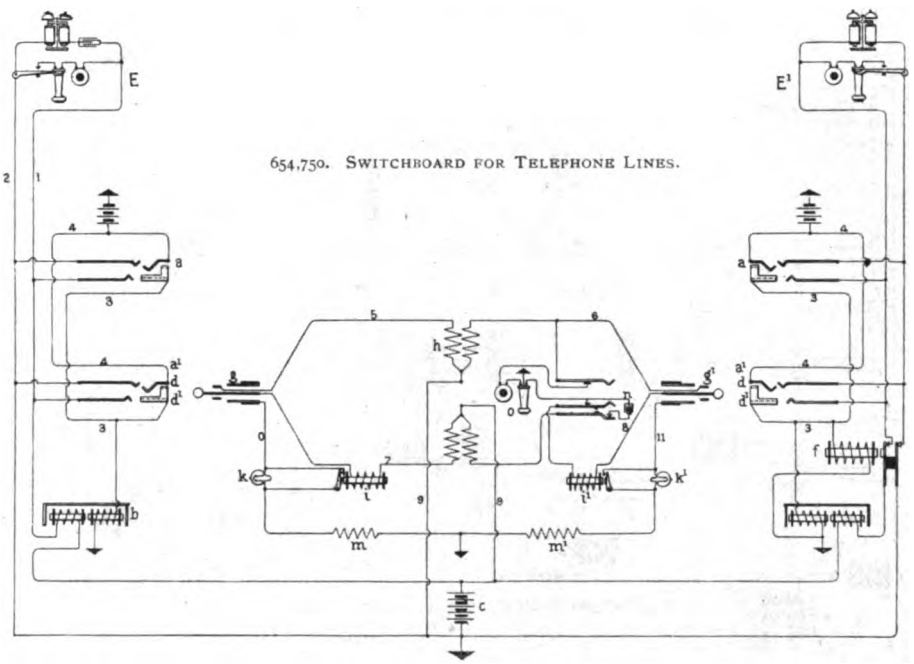
nected to ground thru the impedance coil $a^7$. The user calls by removing his receiver from the hook, whereupon he may converse with the operator, and his lamp *l* at central (in the supervisory circuit) remains lighted for the reason that the condenser $a^7$ prevents the passage of current from battery *h*, altho it passes the voice currents. Upon ascertaining the number wanted and that it can be obtained, the operator tells the user to deposit his coin, and upon such deposit the coin falls on the end of the switch hook within the slot in the chute, and

No. 654,749. — F. R. MCBERTY AND J. L. MCQUARRIE. SIGNAL APPLIANCE FOR TELEPHONE SWITCHBOARDS.

This is a supervisory signal intended to be connected to a number of cord circuits, so as to replace the separate supervisory signals heretofore used. 1 2 are line wires of subscribers' stations having the usual ringer bridge, with condenser, and talking bridge with transmitter and receiver. Line signals *c c* are cut off during connection by the plugs. One clearing-out signal is bridged across the cord with the common battery *d*, thru

Digitized by Google

circuit 5 6. The common supervisory signal is shown at *k*. *g* is a ringing key of the usual type, connecting the generator *h* with the calling plug *e'*, the generator having in series with it a relay *i*, with back and front contacts. If a subscriber has not answered, the ringing current will flow by path *h*-*i*-7-$i^2$-*i'*-7-2-$a^2$-$a^4$-1-7 back to *h*. If the subscriber's telephone is off the hook, that is, if he has answered, the current will be short-circuited thru his talking set, and the decreased resistance will permit the attraction of armature $i^2$, which breaks




the circuit traced, and instantly diverts the calling current thru the lamp *k*, which lights and so informs the operator that the subscriber has answered. Of course this supervisory signal does not work until it is connected, as the generator is connected, so that the operators in this system would be under the necessity of calling every wanted subscriber at least twice.

No. 654,750. — F. R. McBERTY. SWITCHBOARD FOR TELEPHONE LINES.

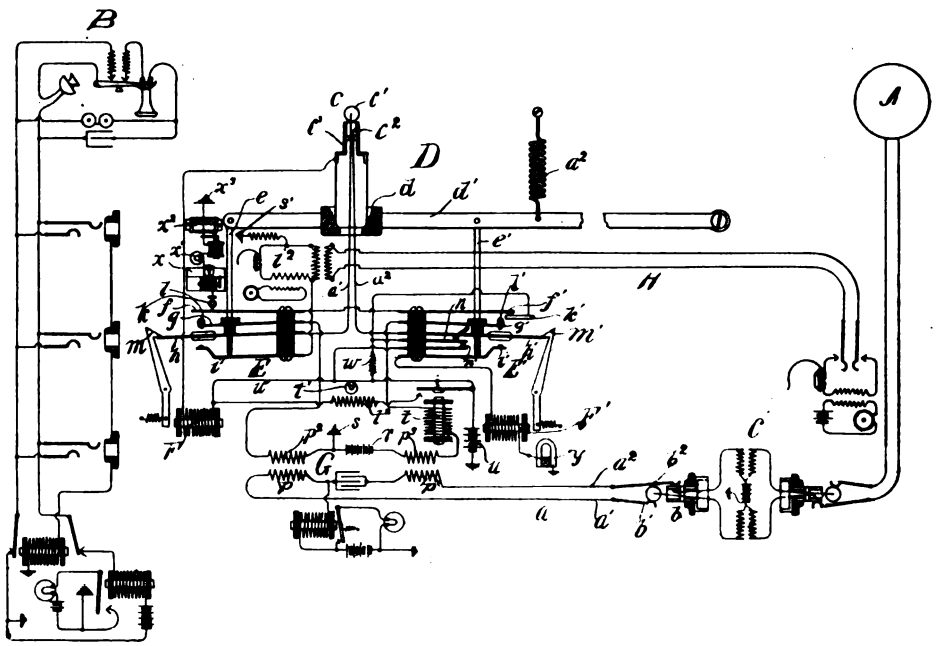
In this case the problem presented for solution is to prevent disturbance on certain classes of lines, especially "noisy" lines, and to make the working of such lines uniform with others on a "bridging board." The real invention consists in leaving the calling plug disconnected from the repeating coil and battery until the connection is established, the successive contacts in the jack as the plug is inserted thus having no effect. The listening key shown at *n* is normally in the position shown, connecting the operator's set but disconnecting the calling plug. In addition to this provision, a cut-off relay of the usual type, shown at *f*, is put in to prevent the grounded battery from producing disturbances on the line to station E'. The current for supervisory signals as well as for test and for the cut-off relay, is furnished by a battery connected to the local circuit 4, having a branch terminal in every jack. This terminal is crossed with the test ring when a plug is inserted, current then flowing to the cut-off relay by wire 3, and to the supervisory signal *k'* by wire 11.

No. 654,758.—J. J. O'CONNELL. APPARATUS FOR TELEPHONE SWITCHBOARDS.

This is a very complicated aggregation of simple elements. It consists of means

Digitized by Google

for automatically cutting in and out the operator on a trunk-line connection, automatically cutting in and out the generator of calling current, and automatically registering the time it takes to get the called subscriber, as well as the number of connections made. The circuits are substantially those of the well-known "relay switchboard"; that is, there are line and cut-off relays, the latter in circuit with the test rings, and a bridged battery with repeating coil in the cord and also in the trunk. The drawing will be much easier to read when this is taken into account. $p$, $p'$, $p^2$, $p^3$, are the four




654,758. APPARATUS FOR TELEPHONE SWITCHBOARDS.

sections of the repeating coil in the trunk line $a$. E and E′ are spring switches with their component springs in the positions shown when in disuse; the trunk plug seat $d$ being carried by a lever $d'$, so that the weight of the plug will serve to restore the springs, thru the plungers $e$ $e'$, after use. The springs $h$ and $h'$ are held down by the detents $m$ and $m'$, controlled by the magnets F and F′, the latter in the generator circuit, and the former in circuit with the battery $u$, so that when the plug is inserted in a jack current will flow in the usual way from this battery to the test ring and the cut-off relay, energizing the magnet F and permitting the spring $h$ to move up against spring $g$, thus completing the thru circuit on that side. When subscriber answers, current from generator Y, which has flowed out to line to operate the ringer, coming back and to ground at $s$, energizes magnet F′, by reason of the decreased resistance in the line after the subscriber's telephone is bridged; and magnet F′ releases spring $h'$, permitting it to rise against spring $g'$, to cut off the generator (at spring $i'$) and reunite the line on that side. This same operation cuts off the register and stop watch $x$, $x'$, $x^2$, which were first cut in at $f$ $k$ and then out at $f'$ $k'$. $t'$ is the usual cord-circuit supervisory signal, shunted at $n$ $o$ while the spring switch E′ is held, and afterward at $t$ by that relay during conversation.

No. 654,924.—C. E. SCRIBNER. SWITCHBOARD FOR TELEPHONE LINES.

The invention in this case is directed to obviating the effects of crossing wrong circuits in putting a plug in a jack, whereby noises in the subscriber's re-

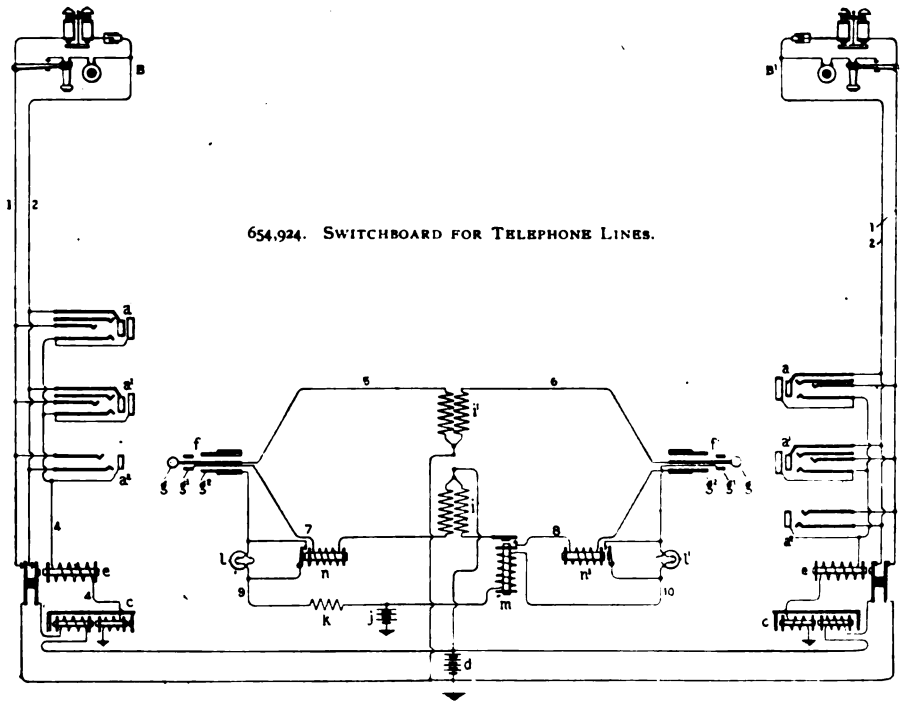
Digitized by Google

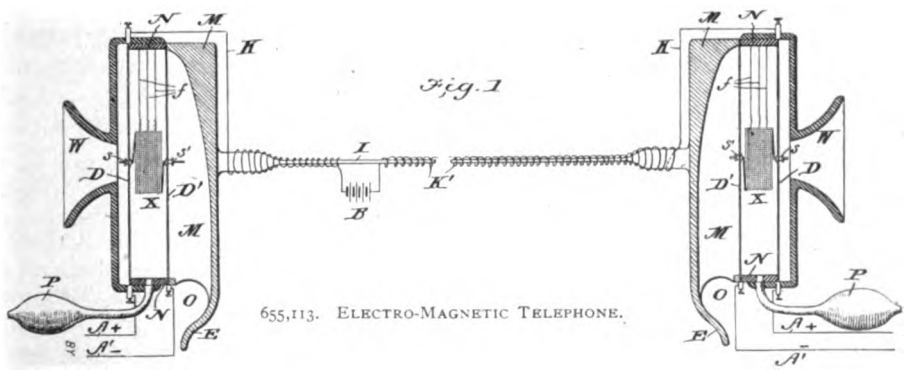
ceiver are avoided. The invention is stated to be particularly applicable to switchboards using the Scribner-Patterson jack described in patent No. 489,571, so that switchboards of that type can be supplied with central energy.

sleeve of the calling plug, when the plug is fully inserted and not before.

No. 655,113.— A. PLECHER. ELECTRO-MAGNETIC TELEPHONE.

In the diagram M is an iron box, at




The connections between the plugs are made such that no opposed terminals will be brought together in switching, and in the circuit 10 of the supervisory signals, closed thru the jack to the cut-off relay in the usual way, a relay *m* is included, which closes a break in the cord at 8, between the battery and the each station. Wire I, connecting the stations, is of iron, and is wound with a fine copper wire, current from battery B flowing over this copper wire constantly. In each station D D′ are diaphragms arranged to form air-tight chambers, with air bulbs P to regulate the pressure. X are coils of bare, fine wire, the convolu-

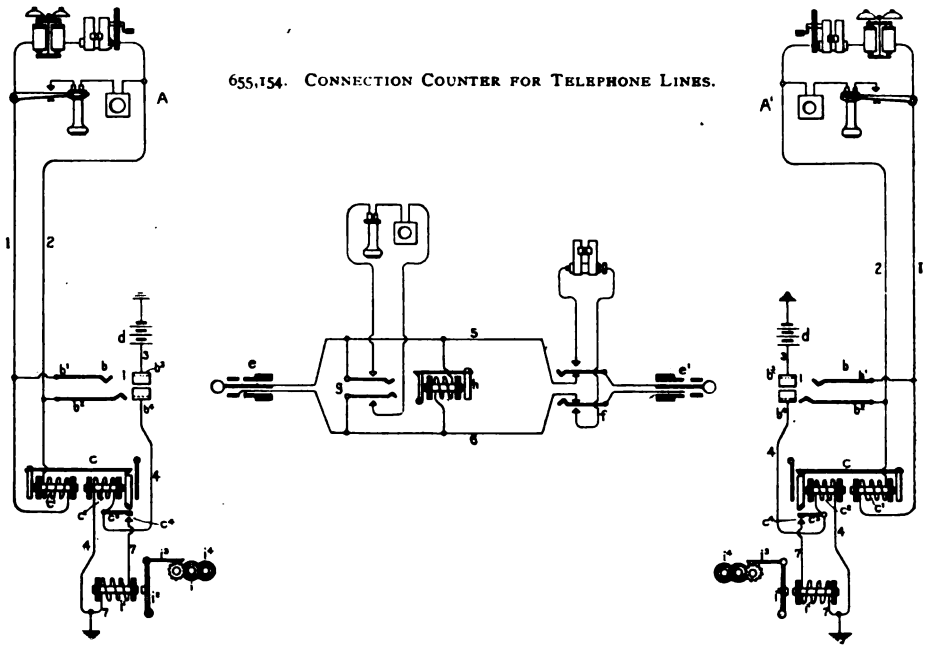
Digitized by Google

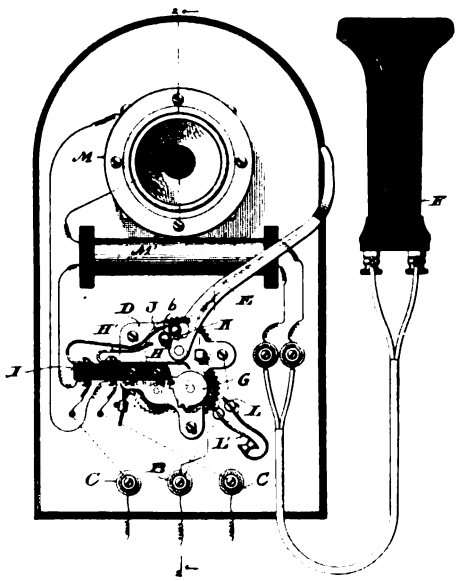
tions of which touch when the diaphragms are vibrated, so as to cut in or out coils or convolutions, and alter the resistance.

No. 655,144.—O. P. AND R. H. YURGAE. ELECTRIC SIGNAL REGISTERING SYSTEM.

This is simply a series line with a number of stations like that illustrated. At each station is a clock train wound when the receiver is hung up, thru the lever E; and driving a number wheel G to send the number of the station to central when the receiver is removed from the hook. Springs H-J normally shunt the telephone set, but at the last end of the motion of the lever E it raises spring J by button K.

655,154. CONNECTION COUNTER FOR TELEPHONE LINES.





655,144. ELECTRIC SIGNAL REGISTERING SYSTEM.

No. 655,154.—C. E. SCRIBNER. CONNECTION COUNTER FOR TELEPHONE LINES.

The entire invention is shown in the lower left-hand corner of the drawing. When the line annunciator falls, contacts $c^3$ $c^4$ are forced together, so that when plug is inserted circuit from battery *d* is completed thru the magnet *i'* to work the register. A line that had not called would not have a connection registered.

---

REPUBLIC, WASH.—A local company is being organized for the purpose of running a telephone line from here to Keller. A direct route down the San Pool river is contemplated, as well as a line from Keller to Daisy, a town on the Columbia river, where a line is already in operation up the river to Kettle Falls.

Digitized by Google

## SOME NEW PROTECTIVE DEVICES.

American Electric Fuse Company, Chicago, has just completed and put upon the market its new style lightning arrester and cross-connecting distributing board. This is an absolutely new device and wherever it has been submitted to the trade it has sold at sight. In addition to the fact that it is the latest on the market, it is the cheapest and most efficient distributing board ever manufactured. It has been carefully tested in practical use with telephone companies and its efficiency is absolutely guaranteed. These distributing boards are made in as many lines as desired, with carbon lightning arresters mounted on either slate or hardwood base, the latter being preferable, and afford perfect contacts for the wires at every point. The method of handling the wires as they come to the distributing board is very unique. The wires occupy practically no space, being compactly and handily arranged for connection with the board. The mountings are all of the strongest polished brass, fitted with compact washers and distributing posts. For the better handling of distributing wires a lock-nut form of binding post is used, which absolutely screws the wires in place. A 50-line distributing board occupies a space of 3 feet 2 inches by 10 inches, with a height of 2 inches at the highest point.

Distributing boards for special purposes can be fitted up whenever desired, using porcelain or the ordinary hardwood base as required by the customer.

Any one interested in this kind of material is requested to write for further information.

---

THE Marietta Telephone Company, of Marietta, Ohio, is engaged in building an exchange that will be a credit to the company and a source of satisfaction to the citizens. The system, which has been purchased complete of the Sterling Electric Company, of Lafayette, Indiana, will be of the centralized energy and automatic flash-light type, and the company will begin doing business with at least six hundred subscribers, a number that will no doubt increase rapidly.

## TRADE NOTES.

G. W. PATTERSON, the well-known representative of the Gordon Battery Company, has found it necessary, owing to the large increase in business, to secure a separate office and storeroom, located at 134 Van Buren street, where he will be glad to meet all old and new friends.

AMONG recent shipments from the "American" factory were included a 1,000 metallic line, flash-light transfer board to Lansing, Michigan, to displace Western apparatus, and a 1,000 metallic line flash-light transfer board to Fostoria, Ohio, also to displace Western apparatus.

AMONG the smaller exchanges recently equipped by American Electric Telephone Company, may be mentioned McKeesport, Pa., 100 lines transfer additional, making the seventh section; Jamestown, Ohio, 100 lines express; Newcomerstown, Ohio, 200 lines express; Ottawa, Ohio, and Canal Dover, Ohio, 300 lines express, each; Loudonville, Ohio, 100 lines express; Napoleon, Ohio, 300 lines express; Portsmouth, Ohio, 600 lines central energy; Leetonia, Ohio, 200 central energy.

AMERICAN ELECTRIC TELEPHONE COMPANY recently closed one of the largest contracts for telephone apparatus of the year. It was made with the Independent Telephone Company, of Terre Haute, Indiana, and contemplates the delivery of a centralized battery multiple switchboard of the latest improved design thruout, with an immediate capacity of 2,000 and an ultimate of 5,000, together with 2,000 telephones, price for entire apparatus aggregating about $60,000.

THE well-known firm of C. H. Worcester & Co., of Marinette, Wisconsin, one of the largest and most prominent lumber dealers in the Northwest, is also prepared to make prompt shipments of telephone and telegraph poles in all sizes and any quantity. Owning some eleven yards along the lines of the converging railroads, the poles are cut by this firm from stumpage and shipped direct to the trade. It is a well-known fact that the finest growth of cedar is produced in that section and C. H. Worcester & Co.

Digitized by Google

owning a large amount of acreage gives the company an unusual advantage in filling large contracts. The fact that the Western Union has ordered 25,000 poles, with an increase to 40,000, shows the great resources of this firm. Just now it is especially well prepared to furnish 20 and 25 foot telephone poles for interurban lines, while for country lines some 15,000 to 20,000 poles, in sizes from 18 to 25 feet, can be shipped promptly. A large quantity of other sizes for crossings and city work, 35-40 feet, is always on hand.


## Wanted.

IN town in Illinois, man and wife to run Telephone Exchange; man to do trouble and outside work. Address

A. B. W.,
Care TELEPHONE MAGAZINE,
Chicago.

## For Sale Cheap.

110 DROP Standard Telephone and Electric Company's Switchboard, in good order. Can be delivered September 15.

TIBBE TELEPHONE CO.,
Washington, Mo.

## Charles A. Brown & Cragg,

ATTORNEYS AT LAW and SOLICITORS of PATENTS,

1450 Monadnock Block, CHICAGO.

EDWARD E. CLEMENT. WM. D. GHARKY.

## CLEMENT & GHARKY
## Patents and Patent Law

GENERAL ELECTRICAL EXPERTS

SEARCHES, REPORTS, OPINIONS

Stephen Girard Building, PHILADELPHIA.
McGill Building, WASHINGTON, D. C.


# Telephone Magazine

## CONTENTS OF THIS NUMBER.


The New Telephone "Office 1" in Berlin, Illustrated. By Post Inspector Lindow ..... 45
To Replace the Bell ..... 55
Telephone Switchboards. By H. P. Clausen..... 56
The Latest Central Battery System ..... 61
The "Western" Toll Line Board ..... 65
Editorial ..... 66
Sued for Competition..... 66
Chicago Telephone Supply Co..... 68
Some New Eureka Apparatus ..... 69
A Perfect Soldering Flux..... 71
Some New American Exchanges..... 71
Pole Line Specifications. ..... 72
Digest of Telephone and Kindred Patents. By Edward E. Clement..... 74
Some New Protective Devices ..... 87
Trade Notes..... 88



The ground is full of elements unable to affect the McRoy conduits.

JOHN T. McROY
302 BROADWAY, NEW YORK
138 WASHINGTON ST., CHICAGO


Digitized by Google

# Telephone Magazine

Copyright, 1900, by Electrical Engineering Pub. Co. Entered at the Chicago Postoffice as mail matter of the Second Class.

VOL. XVI. CHICAGO, SEPTEMBER, 1900. NO. 108

## TELEPHONE SWITCHBOARDS.

BY H. P. CLAUSEN.

(*Continued.*)

### GENERAL SPECIFICATIONS OF SWITCHBOARD AND TELEPHONE EQUIPMENT FOR

(*Name of Company Asking for Bid.*) (*City and State.*)

### GENERAL OFFICE INSTALLATION AND EQUIPMENT.

WORK.

The work to be done consists in furnishing and setting up ready for constant use in the building furnished by the company of a central station equipment for telephone exchange, with an immediate capacity of ..... full metallic circuit lines, and provisions for an ultimate capacity of ..... lines. These provisions to be of such a character that the additional switchboard capacity may be increased to the ultimate capacity without requiring any change in the wiring already installed, other than to increase the number of answering sections, multiple jacks and their connecting cables.

TYPE OF SWITCHBOARD.

The switchboard to be a multiple board, the incoming call signals of which belong to class ..... and are operated automatically from the subscribers' instruments, by taking the receiver from its supporting switch hook, the clearing-out signal being operated in a similar manner. The energy for operating the signals to be taken from a system of centralized batteries.

TOLL-LINE SWITCHBOARD.

The central office is further to be equipped with a suitably arranged toll board, having an immediate capacity of ..... and an ultimate capacity for ..... signals belonging to class ....., both of the above switchboards connecting to each other and with the chief operator and wire chief's desks.

PLACE OF BEGINNING WORK.

The bidder shall begin his work by attaching cables, which are to be furnished by him to the incoming cable terminal heads, which are to be furnished by the (bidder or company) and installed by the company. These terminal heads to be located in a room designated by the company and shown by the plans attached, and the bidder shall furnish all cables, appliances, labor and place the entire exchange room into efficient operation ready for immediate use in every detail.

MAIN LINE DISTRIBUTING BOARD.

Distributing board shall have an immediate capacity for ..... lines and arranged for an ultimate capacity of ..... lines.

INTERMEDIATE DISTRIBUTING BOARD.

Intermediate distributing board shall serve as a connector between the answering jacks and drops and the line wires, together with the multiple jacks. This distributing board shall be constructed so as to take up a minimum amount of space, and to be as near to the switchboard as practicable with the general details of construction.

POWER BOARD AND EQUIPMENT.

The central office equipment shall be provided with storage batteries for charging all relay circuits, line signal circuits, test circuits and operators' transmitter circuits, the batteries to be of such capacities that the entire exchange equip-

Digitized by Google

ment at its ultimate capacity can be operated for a period of..... hours, without requiring recharging of the batteries.

TERMINAL HEADS.

The bidder shall further supply..... combined sneak-current and lightning arrester terminal heads, each complete head to have a capacity for.....metallic-circuit lines. It is required that the sneak-current protector opens and grounds the line side of a circuit thru which a current of .4 of an ampere flows for a period of sixty seconds. The terminal head shall be provided with an auxiliary attachment by which an audible signal is set into action the moment one or more of the sneak-current protectors are operated.

BATTERY-CHARGING GENERATORS.

The bidder shall supply an approved type of battery-charging machines of ample capacity for keeping the storage battery equipment fully charged when the extreme ultimate capacity of the exchange system has been reached. The machines shall be divided into as many units as might produce the best results in practical operation.

RINGING GENERATORS.

The exchange shall further be equipped with ringing generators of such construction and capacities as will give a satisfactory service. The current delivered to be suitable both for ringing polarized magneto bells and selective call party line bells. The construction of this machine to be approved by the company. The charging machines, storage batteries and switchboard battery circuits shall be connected to suitably disposed switches, all mounted on marble slabs, supported by iron framework and substantially mounted in the room designated by the company.

MEASURING INSTRUMENTS.

In addition to the switches necessary for efficiently making the required combinations, there shall be mounted upon the power board a suitable number of voltmeters and ammeters, together with their switches.

In addition to the above machines, the bidder shall furnish all necessary automatic battery cut-outs, field regulating rheostats, automatic starting box, etc., as may be required for insuring an efficient operation of the power plant in its entirety.

FLOOR PLANS.

The bidder shall mark upon the floor plan hereto attached the spaces required for the switchboard, both for an immediate capacity of.....lines and an ultimate capacity for.....lines. The general disposition of the toll board, chief operator's desk, distributing board, power equipments, etc., to be shown in detail. The bidder shall further supply drawings showing the detail of construction of the switchboard cabinet, and the relative disposition of the answering jacks, together with their incoming call signals and multiple jacks. This shall be shown in a drawing showing the general appearance and disposition of one section of multiple board, which shall include a general plan, showing the ringing and listening keys, connecting plugs, order buttons, supervisory signals and all other parts that may form a part of the complete section as a whole. A wiring diagram shall be furnished, showing connection of operator's sets, with the cord circuits, the multiple jacks, line jacks, line signals, supervisory signals, together with any relays or condensers required for operating the entire system. This drawing to include the toll board, chief operator and power board circuits.

OFFICE CABLES.

The cables which shall be required for connecting together the office terminal with the main distributing board, and the main distributing board with the intermediate board shall consist of..... twisted pairs of No. .... B. & S. gauge ninety-eight per cent pure soft-drawn copper wire; the wire to be treated with a perfectly smooth tinned surface and insulated by a first layer of silk and two reversely applied layers of cotton. The wires thus insulated to be twisted together in pairs and laid up into a round-shaped cable, and after all the moisture has been expelled from the laid-up cable by a thoro boiling in paraffin, first wrap of

Digitized by Google

cotton is applied, and over this a cotton braid, which is afterward saturated with a moisture-proof compound. One wire of each pair shall be wound with red and white cotton, and each mate to said red and white covered wire to be covered with a white cotton, the two wires to be twisted together in uniform spirals about seven twists per foot. Cables shall be laid up in such a manner that the respective pairs will be free from cross-talk to each other. When the above cables have been laid in place enough slack shall be allowed between butts for permitting the increasing of the actual butt to butt reach at least eight inches, four inches slack being allowed at each end; this slack to be taken up by a proper disposition of the cables.

SPECIAL WIRES.

All special wiring, including that required for the proper interconnecting of the operator's transmitter and signaling circuits, with the storage batteries, all supervisory circuits, relay current supply wires and ringing current supply wires, to be of the best grade tinned copper rubber covered and braided, all being of such sizes as to fulfill the requirements of the National Board of Underwriters, and insure satisfactory results in practical operation when the entire exchange equipment is completed to its full.....line capacity.

MULTIPLE CABLE WIRE.

The multiple cable which the contractor shall supply for connecting together the multiple jacks with the intermediate distributing board and the intermediate distributing board with the answering jacks, line signals and relays to be no smaller than No.....B. & S. gauge ninety-eight per cent pure soft-drawn copper.

Insulation of the multiple cable wires shall consist of no less than three layers, one of cotton and two of silk, taking the No. 22 B. & S. gauge wire, which runs .0253 inch in diameter, the first layer of silk when applied shall give a total O. D. of .0323; the total O. D. of the second covering of silk shall not be less than .0393, and the total O. D. of the completely insulated wire to be no less than .0515 or more than .060 inch.

After the cable is made up, the laid-up wires must not be treated with beeswax or paraffin. The first cover of the multiple cable wires to be a suitable number of strips of wax paper and over this a cotton wrap, and over this must be placed an approved form of braid. The outside of the finally covered cable to be coated with a fireproof paint. A sample piece of the multiple cable which the bidder proposes to furnish must be submitted to the company for their approval, and this sample piece should conform exactly to the cable afterward furnished by the successful bidder.

SAMPLE JACK AND CABLE FORM.

The bidder shall further submit for the company's approval a strip of multiple jacks, with a piece of multiple cable soldered to the spring jacks. This cable to be of such a length as will allow the company to examine the class of work which the contractor proposes to perform. This sample strip of jacks with cable attached to be retained by the company, and all work of a like nature done by the bidder shall rigidly conform to the approved sample.

WIRING OF LIGHTNING CIRCUITS.

The bidder shall be required to wire both front and back of the switchboards for a sufficient number of electric lamps of sufficient candle-power to thoroly illuminate front and back of the boards, both for operating and making inspection or repairs. Wire for the line circuits shall be of the best quality rubber-covered wire, and all furnishings, including the placing of the lamp switches, conduits, etc., shall comply with the National Board of Underwriters' rules.

WAXING OF FORM.

Whenever it is necessary to cut open the outer covering of any cables for the purpose of making up special forms, the exposed portion of the cable conductors shall be thoroly boiled in pure beeswax.

INTERCONNECTING CORDS.

The cords which the bidder shall furnish to be of metallic-circuit type tinsel

Digitized by Google

conductor. Each conductor to be doubly insulated and bound together with its mate by a cotton wrap. Then over this cotton wrap a brass spiral shall be placed and covered with a polished linen braid. The plug end of the cord to be specially protected by a triple braid of linen. All wire used in the switchboards for winding electromagnets, solonoids, etc., to be of the best quality of copper insulated with silk.

FRAMEWORK.

The framework of the switchboards to be made from iron and wood, of such cross section and so braced as to be strong and rigid. It is preferable, however, that as little iron be used as possible. The bottom section of the board to be of wood, but the entire cabinet to be so arranged that the top may be removed without disturbing any of the line signals or multiple cables. At the same time it must be possible to remove the section of framework which holds the multiple cables, multiple jacks, answering jacks, line drops and top of board without requiring the lower part of the switchboard section being removed or displaced.

WOODWORK.

The woodwork of the switchboard, toll board and chief operator's desk to be of thoroly seasoned hardwood jointed and finished in a neat and substantial manner, being the wood preferred.

The hard rubber, german silver, steel, brass, iron and other materials used to be of the best quality, and shall be specially adapted to the services for which they are to be used.

EQUIPMENT.

The equipment will include, in addition to the apparatus already mentioned, operator's head telephones and transmitters for each position, fully equipped desk for chief operator, with plugs, jacks, ringing and listening keys, transmitters and all other necessary apparatus wired up complete, so that the chief operator can connect with any of the operators' positions. The keyboards on the switchboards to be hinged, so that they can be lifted up for the purpose of inspection of apparatus or making repairs.

PILOT LAMPS.

Each operator's position upon the main switchboard shall be equipped with an incoming call signal lamp. This lamp to be connected in such a way that when an incoming call is recorded, the lamp on the chief operator's desk lights simultaneously, both lamps being extinguished the moment the operator responds to the caller by inserting an answering plug into the answering jack, the lamps remaining lighted until this operation is performed. The operator's transmitter shall be so suspended that any desired adjustment, either forward, backward or downward, may be made by an operator without leaving her position.

OPERATOR'S TELEPHONE.

Each operator's position shall be equipped with a light-weight watch case receiver, to be held to the operator's ear by a leather protected metal band passing over the operator's head. The receiver shall be connected to the switchboard circuits by means of a flexible silk covered tinsel conducting cord with plug attached, the plug being so constructed that it may be placed into or withdrawn from a special connecting jack which shall have an auxiliary set of contact springs, that automatically open up the transmitter battery supply circuit whenever the receiver plug is removed from the jack. Each operator's position shall be equipped with no less than ..... sets of interconnecting cords, together with supervisory signals, circuit changing keys, etc.

OPERATION.

Each bidder shall describe in detail and in proper order each and every step required in producing a connection between one subscriber and another. The operation of each part shall be described in detail, beginning with the subscriber's call to central, either automatic or manual, a full description of the line signals, whether they be of the I, J, K, L, M, N, O, P or Q type, operator's busy test, whether same be visual or audible, and method of signaling over the line of the

Digitized by Google

subscriber with whom the connection may be required. If the bidder proposes to supply any special system for informing the caller that the called-for subscriber's line is busy, a clear description of the system will be required. In making this description of the entire operation, it is preferred that the bidder provide a diagram, which should accompany the general description.

TELEPHONES.

The bidder shall submit proposal for furnishing ..... telephone instruments, equipped complete. These instruments to be designed so as to give the most satisfactory results when operated in connection with a system of switchboards which the bidder proposes to install, the material used in the telephones, as also the general workmanship, to be first-class, and conforming in every respect to a sample which the bidder shall submit for the company's approval, said sample to be retained by the company, and no change made from the general form of construction without a written permission from the company.

The bidder shall furnish a diagram showing the wiring of the telephone instrument and the approximate resistance of the signal-bell coils, receiver coils and induction coils, both primary and secondary, and the capacity of condensers if they propose to use any. The receiver shall be of the double-pole type and encased in a hard rubber shell. The magnet coils in the receiver shall be connected to a set of binding posts protruding at the back, equipped with a double set of lock-nut binding posts. The construction of the receiver shall preferably be of such a form that all of the elements comprising the instrument may be removed and inspected without requiring the unsoldering of any connecting wires. The transmitter shall be mounted on an adjustable arm and connected to the primary of the induction coil and battery by means of a circuit which does not depend upon hinged bearings for its continuity. The automatic receiver supporting switch hook shall be of the long lever type. The receiver supporting prongs shall not terminate in a pointed end, it being preferred that the ends be rounded disklike. All wire used in the telephones for connecting the several elements with each other shall not be smaller than No. —— B. & S. gauge. The wire shall be well tinned and covered with an approved insulation. Wherever practicable, all joints shall be soldered, but under no circumstances shall any untinned joints be soldered together, as this would require the use of an acid, which will not be allowed. Rosin to be used as a flux in all cases.

In addition to the above form of specification, the purchaser frequently demands that a time limit be set in which a date is specified upon which the central office equipment must be complete in every respect and ready to be delivered to the purchaser. Thus, for example: "The contractor may be required to complete the entire central office equipment within .... days after the completed exchange building or room is turned over to him ready for the reception and installation of the above specified apparatus." Usually, however, the above clause is agreed to by the contractor with the understanding "that it shall be allowed at least .... days for building the exchange equipment before the ....day limit shall take effect and begin to expire." In other words, "The contractor shall be allowed....days from date of signing and final acceptance of contract to date of final completion of the installation," and "If the contractor fails to complete the above-described equipment within the time specified he will pay to the purchaser a penalty of $.....per day and for each day thereafter until the installation is completed." Then again —"the contractor shall not be held liable for delay caused by failure of the purchaser to turn the exchange building over to him in the time specified, or any delay caused by the acts of persons and of circumstances over which he has no control."

Patent guarantees are usually required by the purchaser and granted without opposition by the contractor. The following form of guarantee has long been used by a manufacturer of telephone apparatus and may safely be regarded as meeting the general requirements:

Digitized by Google

PATENT GUARANTEE.

"It is understood and agreed that in accepting this proposal, the purchaser covenants and agrees that he will not violate or infringe the contractor's letters patent or patent rights or any of them, nor contest the validity of same or the contractor's title thereto. In case suits are brought against the purchaser alleging infringement of letters patent by the use of the hereinafter described apparatus or any portion of the same furnished by the contractor, the contractor agrees to manage and defend such suits at his own cost and expense and to pay all sums that the purchaser shall be adjudged or decreed to pay in such suits as damages, profits or costs of suits; provided the infringement shown in such suit or suits does not result from the use of parts of apparatus not furnished by the contractor, and provided also, that notice of service of process in any such suit and of any action taken by the complainant therein, be given in writing without delay by the purchaser to the contractor and that the purchaser's agents, officers and employes shall give all needed information, assistance and authority in any such suit as far as possible, and provided that purchaser proves clearly that the action was brought against apparatus furnished by the contractor."

When an experienced engineer draws up a set of specifications for telephone exchanges he is expected to specify the provision of all apparatus and appliances required for the efficient operation, supervision and maintenance of the central office equipment. As a rule, one or more monitor or supervising operator's desks are required, also a wire chief or trouble clerk's desk or both are called for. Briefly, the wire chief's desk needs to be equipped with a Wheatstone bridge, a voltmeter, galvanometer, ammeter and a set of 60 or 100 cells of testing batteries. However, the apparatus required and method of operating will be treated more fully as we proceed with the general description.

Regarding the specifying of apparatus required in the subscriber's station, the writer believes that the following list of operative elements is sufficiently complete for permitting the construction of any desired combination or probable form of telephone equipment, granting, of course, that the specification be prepared by a person fairly familiar with telephonic apparatus in general:

ELEMENTS OE A TELEPHONE EQUIPMENT.

1. Speech receiver (hand telephone).
2. Speech receiver support.
3. Signal transmitter (magneto generator, kick coils, etc.).
4. Signal transmitter support.
5. Switching apparatus, manual.
6. Switching apparatus, automatic.
7. Switching apparatus support.
8. Signal receiver (magneto bell).
9. Signal receiver support.
10. Speech current transmitter (microphone).
11. Speech current transmitter support.
12. Speech current generator (electric battery).
13. Speech current generator support.
14. Speech current transformer (induction coil).
15. Speech current transformer mounting.
16. Line wire terminals (binding-posts, etc.).
17. Interconnecting wires, fixed.
18. Flexible interconnecting wires (receiver and transmitter cords).
19. Signal recorder (drop shutters, gongs, etc.).
20. Auxiliary signal (extension bells, constant ringing attachments, etc.).
21. Auxiliary signal mounting.
22. Condensers.
23. Resistance and retardation coils.
24. Restricted service apparatus.
25. Coin-controlled apparatus.
26. Protecting apparatus (lightning arresters, etc.).

NOTE.—The next section of these articles will be devoted to fundamental design of telephone exchange apparatus. In preparing this section the writer's chief aim has been to treat the subject in such a manner that the most inexperienced telephonist will derive the greatest possible amount of information from the articles.

"I can not do without the MAGAZINE at any price." P. F. SHOWALTER.

Digitized by Google

# TALKS AND CROSS-TALKS.

BY A. E. DOBBS.

HINTS TO CORRESPONDENTS.

Write on one side of the paper only, and make sketch or diagram, when necessary. Endeavor to give all the facts bearing on the case, so as to enable the editor to answer intelligently.

Name and address must accompany each letter, not for publication, but for the information of the publisher.

COUNTRY LINES.

The Inspector has some very interesting questions on hand this month, and some in which he has to read between the lines and guess what the trouble is. In one case a young gentleman writes us to know whether in a bridging, party-line system it would not be a good idea to begin with a bell of 1,600 ohms and reduce the resistance of the ringers till the last one would have a resistance of only 80 ohms; and from the manner in which his question is put we judge that his present line equipped with 1,600-ohm ringers is not entirely satisfactory. Now, Elmer, if your 1,600-ohm ringers are not giving good service there may be four reasons for it.

First, an overloaded line or one on which there are too many instruments for the generator to do justice to.

Second, your generators may not be very efficient.

Third, there may be a heavy leakage on the line thru trees or other sources of low insulation, so that the current is wasted instead of doing useful work; or,

Fourth, so much resistance in your line that the proper amount of current can not reach the bells farthest out.

Now, if Elmer would stop and think, he could see that, supposing there were ten instruments on the line, the instrument nearest the 80-ohm bell would be practically short-circuited, so that current enough to throw the drop would not reach the exchange. Sometimes, it is true, a low resistance drop is used *at the exchange* on a line of this kind, but that is for the purpose of keeping the subscribers from ringing each other, so that when a subscriber rings, nothing but the exchange drop is affected, and of course this low-wound drop is cut out when the exchange rings a subscriber.

---

The subject of transpositions still seems to be a troublesome one in spite of all the Inspector has said on the subject.

There are so many young fellows who still seem to think that transposition of two parallel-grounded lines will cure cross-talk. Is there no way to make plain the idea that transposition of grounded lines will only make matters worse, and that the only cure for cross-talk in such cases is metallic circuits systematically transposed in relation to each other?

---

BATTERIES.

47. I should like to know the best kind of battery to use on a switchboard and also on toll lines.

The most practical battery to use on switchboard transmitters is three or four cells of gravity battery, and on toll lines a battery with a large zinc surface and a low internal resistance. Where a very powerful current is required either storage cells or the standard Fuller cell may be used. The batteries you mention have a very powerful current on short circuit, but their pressure is very low, being only .75 of a volt, and as the resistance of a telephone transmitter is quite high, being generally from 20 to 80 ohms, it would take four of them to do the work of two sal ammoniac cells, which have an e. m. f. of 1.5 volts.

The best results are obtained generally with a current of .2 of an ampere in the transmitter.

---

48. We have a small exchange using a grounded system. Sometimes, when a subscriber rings up, more than one shutter will

Digitized by Google

fall, and often when we ring subscribers one or more shutters fall. There are no crosses in the lines.

Your trouble probably comes from connecting two or more subscribers to one ground rod, and said rod making a poor earth contact. In this case a resistance of 200 ohms in your ground contact would mix things in the way you describe.

---

49. Would you advise the use of bridging 'phones on a toll line twenty miles long between two exchanges using series 'phones at each end?

If there are stations between the two exchanges, yes; otherwise, not.

---

50. Our night bell sometimes rings by simply closing the switch when no drops are down, and sometimes it will not ring when the drop falls.

In the first place, some of your drop springs are probably grounded on the frame of the drop, making a closed circuit. In the second, your battery is either run down or your spring makes poor contact with the drop shutter.

---

A MAN WITH AN OPINION OF HIS OWN.

51. To THE TELEPHONE MAGAZINE:

Gentlemen,—I notice in your July issue (under arrangement and equipment of new exchanges) the Inspector says that the use of low-wound bells and drop-coils in a common-return system enhances cross-talk. I differ with him for the following reasons:

When a station is busy all auxiliary parts are out of circuit except a high-wound drop-coil bridged across the cords.

Let us assume that we have an exchange of one hundred lines having an average resistance of 60 ohms each, and a common-return wire of 20 ohms. By the use of 500-ohm bells and drops, each line then has a resistance of 1,060 ohms; placing these lines in multiple, which is done on a common-return system, reduces the resistance to 10 6 ohms, which, when joined to a common return of 2.0 ohms, makes a still further reduction to 6.92 ohms.

Now, if these bells and drops are low-wound to, say, 80 ohms, 80 + 80 + 60 = 220 ohms inclusive. One hundred such lines in multiple have a joint resistance of only 2.2 ohms, which is again reduced by the return wire to 1.98 ohms as compared with 6.92 ohms with the higher-wound coils.

We will now suppose that the receiver is 80 ohms and the induction coil 20 ohms, which is the standard resistance of the Bell long-distance coils, the sum of line, receiver and coil is 160 ohms. If four lines are busy, the amount of current leaking from one to the other is a ratio of 6.92 to 1.98, or nearly 4 to 1 in favor of the 80-ohm bells. Can the Inspector disprove this?

Yours truly,
J. O. SCOTT.

Jacksonville, Illinois.

Our Central Union friend has made one or two mistakes in his argument.

In the first place, it is not customary, unless very lately, to use 20-ohm induction coils on a common-return system.

In the next place, it is not the proper thing to use a return wire having 20 ohms' resistance.

If, for example, the aggregate resistance of your lines and apparatus is 2.2 ohms, your return wire should not exceed that, while it would be better to have it even lower.

Now, the Inspector doesn't care much for mathematical problems, but he will reduce Brother Scott's proposition to figures of another kind.

In the first place, the object of the return wire is to return as much of the current to the office as possible, or if it is not brought into the office to act as a balance wire between the different lines, so that in carrying back this current they will all receive the same amount, which will not be the case if there is any appreciable resistance in this wire.

EXAMPLE 1.—Taking up the case first mentioned of 500-ohm drops and bells and 60-ohm lines, as seen before, we have a total of 10.6 ohms on the lines and 20 on the common-return, thus giving only about 35 per cent of current to the return wire and 65 per cent to the line wires. Now, supposing that ten subscribers were talking under the conditions assumed, of 160 ohms each (20 to the induction coil, 80 to receiver and 60 to the line), the combined resistance of the lines *in use* would be about 16 ohms to the office, while that of the remaining 90 lines would be raised to nearly 12 ohms. Now, what is the condition of our return current? Expressed in percentages of 100, it stands:

Common return, 20 ohms. Return current, 25 per cent.

Lines not in use, 12 ohms. Return current, 43 per cent.

Lines in use, 16 ohms. Return current, 32 per cent.

Digitized by Google

Twenty-five per cent of the return current, divided among ten lines, gives 3.2 per cent to each, and as Professor Pupin has shown that even 2 per cent is enough for commercial business, it requires no great mathematical ability to discover that such a state of affairs would mix things somewhat.

This, of course, leaves out of consideration the fact that the induction coils and receivers would probably cut this current down to 1 per cent, but even this small amount would be audible.

EXAMPLE 2.— Now, by the use of 250-ohm induction coils, the resistance of our circuits would be 80 + 250 + 60 = 390 ohms, or a total of 39 ohms for the lines in use, and we stand as follows :

Common return, 20 ohms. Proportionate return current, 31.5 per cent.
Lines not in use, 12 ohms. Proportionate return current, 52.5 per cent.
Lines in use, 39 ohms. Proportionate return current, 16 per cent.

Thus we see that the ten lines in use would, in this case, have 1.6 per cent instead of 3.2 per cent as in Example 1, which the induction coils would reduce to .5 per cent or less.

EXAMPLE 3.— In this case the conditions are the same as in example 2, except that the resistance of the return wire has been reduced to 4 ohms.

Common return, 4 ohms. Return current, 70 per cent.
Lines not in use, 12 ohms. Return current, 22.7 per cent.
Lines in use, 39 ohms. Return current, .07 per cent.

In this case we see the return wire gets 70 per cent of the return current. While making the same allowance for self-induction as in example 2 we would have about .2 of 1 per cent leakage into other lines in use.

EXAMPLE 4.— In this case we take up Mr. Scott's second proposition to use 80 ohm bells and drops, 60-ohm lines, and a 20-ohm return wire. Our line resistance, as already stated, is 80 + 80 + 60 = 220 ohms.

Of lines in use (10) we have 20-ohm induction coils, 80-ohm receivers, and 60-ohm lines, giving for 10 lines $\frac{1}{10}$ = 16 ohms.

Now, the proposition is as follows :

Common return, 20 ohms. Return current, 9.4 per cent
90 lines not in use, 2.4 ohms. Return current, 78 per cent.
10 lines in use, 16 ohms. Return current, 12 per cent.

Giving us, therefore, 1.2 per cent of stray current, which is sufficient, even with the "kick" from the induction coils, to make itself heard.

This brings us to

EXAMPLE 5.— In this case the conditions are the same as in example 4, except that 250-ohm coils have been substituted for the 20 ohm coils.

Common return, 20 ohms. Return current, 9 8 per cent.
90 lines not in use, 2.4 ohms. Return current, 85 per cent.
10 lines in use, 39 ohms. Return current, 5 per cent.

Which gives us, with the self-induction of the coils, about $\frac{1}{8}$ of 1 per cent, which would not make a great deal of cross-talk from this source.

EXAMPLE 6.— With 10 plugs up, or twenty lines in use:

Common return, 20 ohms. Return current, 11 per cent.
80 lines not in use, 2.75 ohms. Return current, 77 per cent.
20 lines in use, 18 5 ohms. Return current, 12 per cent.

Which leaves .6 of 1 per cent escaping into each other line in use, without making allowance for self-induction of the coils, which would probably reduce it to $\frac{1}{4}$ of this amount.

EXAMPLE 7.— The same as example 6, except that the resistance of the return wire has been reduced to 2.75 ohms to balance the 20 lines in use, and our percentages now stand as follows :

Common return, 2.75 ohms. Return current, 46.3 per cent.
80 lines not in use, 2.75 ohms. Return current, 46 per cent.
20 lines in use, 18.5 ohms. Return current, 7 per cent.

Thus, we see that by having a return wire of the proper size, our leakage only amounts to .3 of 1 per cent, which, as stated before, will be reduced to less than .1 of 1 per cent.

Now, all of this supposes that the current would be continuously in one direction; but with telephone currents this is not the case, and so far we have taken

Digitized by Google

no account of the self-induction of the ringers, nor of the part played by static induction.

With one wire surrounded by 99 others, all carrying currents equal to its own, the comparatively low self-induction of the 80-ohm coils will be exerting a static influence much greater than a single wire could do. With 500-ohm coils, however, whose telephonic resistance is much greater than 500 ohms, this current would be so weak that its static effect would be negligible, so that the only effect of this kind would come from the return wire itself, which would be next to nothing on short lines.

HAS ANYBODY TRIED THIS?

52. We have an opportunity to put cross-arms on electric-light poles for a distance of four or five miles, the arms being about five feet below the electric-light arms, the lines being copper-metallic. Our alternative is to put up separate poles under the electric-light poles, the latter being 35-foot poles.

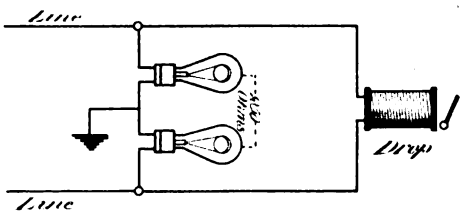



FIG. 1.

If you have no choice but to go on separate poles underneath the electric-light line, you had better use the electric-light poles, as then the wires will not touch anything but their own insulators; whereas, with a separate pole line, it might be a hard matter to keep the wires clear, anyhow, of the electric-light poles.

If there is only one line to build, it would be better to make it a bracket line, placing both brackets on the same side of the pole, so that the wires will not be more than twelve inches apart, as in that case the plane of the telephone circuit will be at right angles to that of the lighting circuit, and more nearly affected by both to an equal degree.

Transpose every fourth pole, or oftener.

LIGHTNING DISCHARGES.

53. Referring to the crackling noise about which you have had several letters, we have been annoyed and are, even at this time of the year, principally on one of a half-dozen toll lines.

Our experience does not agree entirely with that of some of your other correspondents. We find that grounding the line on either side does not cure the trouble, and have tried bridging two incandescent lamps across the line and grounding the middle point (Fig. 1), without any beneficial effect. This seems to show conclusively that the charge does not accumulate upon the line, but jumps on to and from the line in a manner similar to the discharge of a cloud when a charge is released from an adjacent cloud.

Yours very truly, ARTHUR HOOPES.

Supposing that your line is well insulated, so that it does not take up differences in the earth currents, your trouble seems to be lightning discharges pure and simple, on a small scale, perhaps, but none the less lightning, while a thunderstorm within fifty miles of the line will produce, to a greater or lesser degree, the disturbances complained of.

By the way, you must have powerful talking instruments to be able to talk very far past a non-inductive bridge of only 250 ohms.

NOT ARMATURE WINDERS.

54. We have had more or less trouble with our burned-out bridging generators. They are rewound exactly as when sent from the factory. They are assembled with like poles together, and the field magnets seem to be as strongly magnetized as before, but when connected up to line they rarely if ever give as great a current output as before.

If your generators are wound and assembled as before, and the magnetism not changed, they should give the same results.

The Inspector never could wind these armatures as they were before, at least not with the facilities provided in an ordinary telephone exchange. How did those armatures get burned out, anyway?

55. Do you think that the mica fuse, a cut of which I send you, will protect an instrument from sneak-currents?

Yes, provided they are sensitive enough, and further provided that there is a ground on your line enough to cause them to act. No fuse will act when crossed with a high-tension current unless there is a ground on both the high-tension circuit and the telephone circuit. When two perfectly insulated metallic

Digitized by Google

circuits are crossed together a fuse will not act, tho both circuits are, to a certain extent, disturbed and unbalanced. If, again, there should be a ground on the high-tension circuit and a cross with a metallic circuit telephone line, there would be no effect on the fuse unless there should also be considerable leakage or grounding of the telephone line also. Yet a lineman or operator under these conditions might receive a severe or even fatal shock. The only difference between a fuse and heat coil is that the latter is composed of finer wire wound in a smaller space, and is, therefore, rather more sensitive, as the heat can not be dissipated so rapidly by contact with the air.

56. Having recently purchased an ohmmeter, would like to ask for some instructions in regard to locating crosses and breaks and other troubles which are likely to occur, especially on our long toll lines with bridged bells.

to locate your trouble with a fair degree of accuracy.

If you have a ground wire at each station you can now send a lineman over the ground and request him to disconnect one side of the line alternately at each station and ground each leg alternately, which will also give you another set of constants by using the ground at F, which is so arranged that it can be switched from one leg to the other.

Next connect both legs to ground and open the lines completely, both legs of the circuit at A, B, C and D successively, and supposing that your line has an insulation resistance of 10 megohms per mile, 10 miles would give one megohm, 20 miles 500,000 ohms; 30 miles 333,333 ohms, and 40 miles 250,000 ohms. Now you see that if both wires were broken and this ground test showed 750,000 ohms, your distance would be $\frac{10,000,000}{750,000}$ ohms $= 13\frac{1}{3}$ miles to the break.

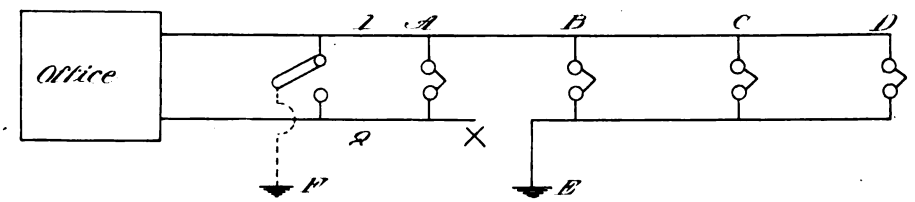



FIG. 2.

The only way to get at the condition of the lines is to put them in good condition and then measure every portion of it.

Let us suppose that in Fig. 2 the stations A, B, C and D are ten miles apart. Proceed to call up A and request him to short-circuit his instrument for a few minutes, and then measure the line carefully for resistance. In this way you will get the resistance of your line to this station from which you can figure out the average per mile.

Then call up B, and meanwhile ask A to disconnect his instrument when the short-circuit at B will give you the constant for that station, and so on with all the rest.

You might also measure these lines from station to station with the instruments in circuit and get another set of constants for this condition of things. In case of a cross you can then proceed

If you were also to call up A, B, C, D and by getting them to open their instruments, get a constant for each leg of the circuit, you might in that way locate the break at X without much trouble. You might also by putting on a ground on No. 2 leg at F and measuring back on No. 1 leg to the ground at E locate it fairly well, tho you must not forget that if your wire at E was lying on comparatively dry ground or on the grass the resistance of that ground might be several thousand ohms.

In order to get the above constants with a fair degree of accuracy, you should take them in all kinds of weather.

57. I have a telegraph line and use battery as per sketch (Fig. 3). No. 1 wire is of No. 9 iron and has thirty-four relays, which were originally of 150 ohms resistance but which are now divided and connected in multiple reducing their resistance to 37.5 ohms.

Digitized by Google

No. 4 wire is No. 8 iron and has 38 150-ohm relays on it. We have considerable trouble on these lines, especially during wet weather, altho perfectly insulated. We have been thinking of cutting the wire at P, and using repeaters, but would like the Inspector's opinion. W. P. ILL.

In the first place, by relays in multiple is meant the arrangement similar to

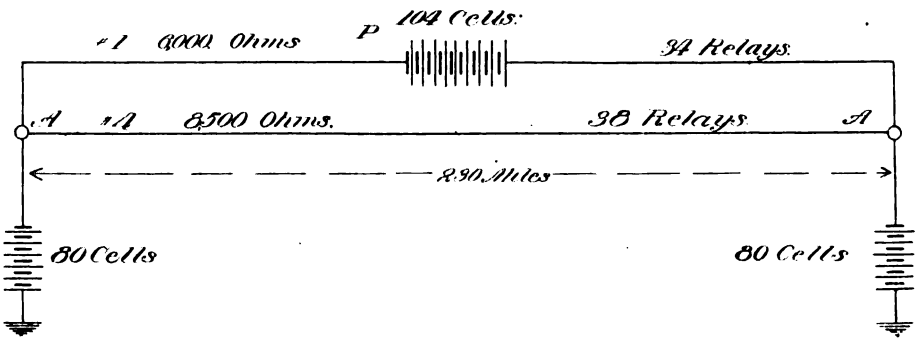



FIG. 3.

Fig. 4 in which each spool of the magnets is separately connected to line instead of having both in series in the usual manner, the object being to save battery and also secure quicker action in the relay. But while this method allows of a lower voltage it seems to require more current, and in a line having 6,000 or more ohms resistance the Inspector would recommend that the 150-ohm relays be retained.

Now let us examine the conditions found in this circuit. We have first 80 cells at each end giving out a potential of practically 150 volts. The respective resistances of our lines as shown in Fig. 3 are 6,000 and 8,500 ohms, including of course that of the relays and batteries, giving us for both circuits a joint resistance of 3,700 ohms; and as the formula $C = \frac{E}{R}$ applies in this case, we have a current output of .04 of an ampere for both circuits or 40 mil-amperes from this battery alone, which is divided between the two lines or would have were it not for the counter e. m. f. of 100 volts from the battery in line No. 1, which meets our battery at the end, and thus we have 150 — 100 = 50 volts effective pressure to be applied to this line; but the 104 cells also help out the 50 volts again, so that the pressure on line No. 1 is still maintained at 150 volts $\frac{150}{6,000.} = .025$ or 25 mil-amperes.

As the second line (No. 4) would in this way get the benefit of the back pressure on No. 1, we would have nearly 100 volts to give this line $\frac{100}{8,500} = .012$

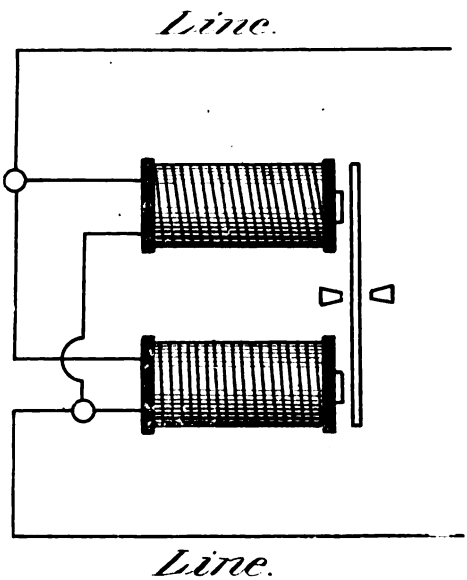



FIG. 4.

or 12 mil-amperes, which is hardly sufficient for a 150-ohm relay, and in wet weather this would be still further reduced by leakage.

Now if you will notice the position of wires No. 1 and No. 4 you will further observe that No. 4 constitutes a partial return for No. 1 as well as the earth, and 25 mil-amperes is hardly enough for a

Digitized by Google

relay of 37.5 ohms resistance. This is further reduced by rainy weather when there would no doubt also be a slight interference between the circuits.

If a repeater is not used it would be well to separate the two lines by grounding No. 1 behind instead of ahead of the battery and use battery enough to bring No. 1 up to 40 mil-amperes or 240 cells, and use the 160 cells for the No. 4 line, which would bring the current up to 17 mil-amperes for No. 4; or, by splitting these relays also you would reduce the resistance of the line by 4,275 ohms, which would give you 35 mil-amperes for working with.

## THE CHICAGO EXPRESS BOARD.

The highest state of the art in express type switchboards is undoubtedly embodied in the Chicago express board, if the claims of the manufacturers and the

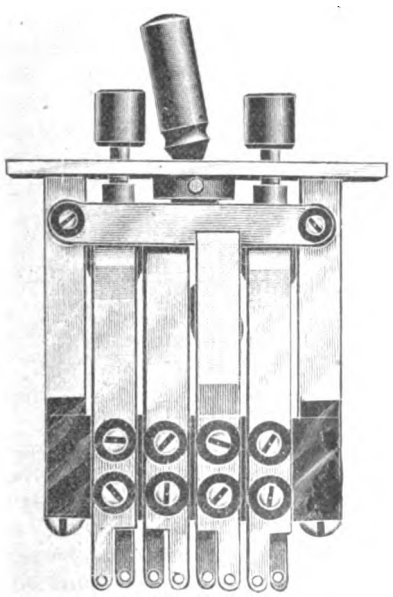


FIG 1.

statements of purchasers are based on fact.

One great source of trouble in most switchboards is the operator's key. The Chicago key (Fig. 1) is said to be the simplest and most perfect one yet produced. The Chicago Telephone Supply Company will be glad to furnish samples

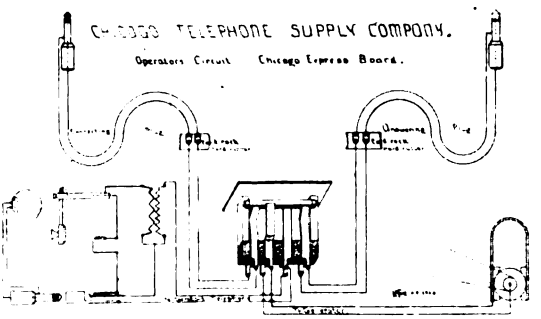



FIG. 2.

of this key to responsible exchanges at any time.

It often happens that an unsatisfactory switchboard can be made to give very fair service if equipped with an operator's key that can be depended on under any and all circumstances. The Chicago key is self-contained and can be attached to any board of any make.

The diagram for connecting it is illustrated in Fig. 2. It will be observed that for common-return boards only one side of the key will be used. When the operator's set is cut in by pulling lever forward, no break can possibly be made in the cord circuit. When ringing out on either line, the cord circuit must be broken before the generator is cut in, thus preventing the possibility of ringing back in the ear of the calling subscriber.

The mechanism of this key is simple in every detail. Mechanical simplicity is usually, if not always, necessary before electrical efficiency is possible.

The details of the Chicago express switchboard are fully illustrated and described in a folder recently issued by the Chicago Telephone Supply Company.

Every well-posted exchange manager should investigate this board, because so many points of excellence, superiority and simplicity are claimed for it.

## STUDIED SWEETNESS.

"When a man woos a girl, let him not base his choice
On opinions inspired by her telephone voice."—*Chicago Record.*

Digitized by Google

## THE HOLTZER-CABOT BI-POLAR RECEIVER.

The invention of the magneto receiver made practical commercial telephony, and there is no part of the instrument which is used for the transmission of sound that is of so great importance today as the hand telephone receiver. When properly constructed it is an instrument of marvelous sensitiveness, yet if mechanically well made there is very little liability of its giving trouble. In the several different forms of receivers which the company has put on the market, it has always considered durability as a most important point, and the bi-polar type the company now offers can be relied upon for lasting service and freedom from breakdowns. The following are some of the principal characteristics of this instrument, which will be readily recognized as desirable features by experienced telephone engineers.

The form of the shell is at once graceful in appearance and convenient to the hand, as will be seen by reference to Fig. 1. In size it is but 5½ inches in length,

FIG. 1.

including binding-posts, thus being in pleasing proportion to the usual substation equipment.

The manner in which the distance between the diaphragm and pole pieces can be varied is extremely simple and novel. By referring to Fig. 2 four screws will be noticed arranged around the coil; to effect adjustment these are first loosened and then by turning the back cap (or tail piece) the poles can be

FIG. 2.

accurately and rapidly brought to the required distance from the diaphragm, and then by means of the four screws being tightened again positively locked in position.

The peculiar shape of the pole pieces was arrived at after a careful study of the magnetic field in the ordinary bipolar instrument, the object being to utilize all magnetic lines and obtain a strong, even circular pull on the diaphragm. A special form of binding post has been designed for attaching the cord tips to the receiver. By tightening the hexagon nut shown at the top of the post, a sliding block is drawn up and holds in a viselike grip the cord tips so that it is impossible for them to work loose, nor can the posts themselves turn or change their relative position.

Fig. 3 shows the interior magnets with coils and tail piece, the tail piece being separate from the rest of the shell so that it can revolve independently of same when adjusting. Permanent magnets are of compound construction, something that is often sacrificed in building a bi-polar instrument. This form of building up the magnets and our long experience in the tempering and hardening of steel for the purpose is a guarantee that this part of the receiver can be relied upon both for strength and lasting qualities.

Digitized by Google

It is of great importance in a telephone receiver that all parts bear proper relation to one another, and the company has been particularly careful in this respect with its new bi-polar instument. The windings on the spools are just the proper number of turns to give the best results working in conjunction with the strength of the permanent magnet. The

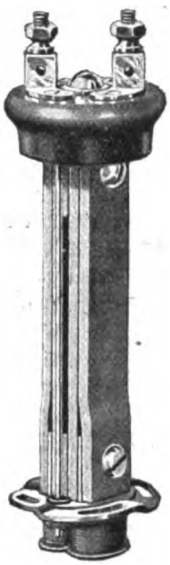


FIG. 3.

diaphragm is of the proper diameter and thickness to accurately reproduce sound waves and yet not introduce any after vibrations which have the effect of adding a metallic tone to the transmitted speech. The receiver is not only extremely sensitive and well made, but it has a remarkably clear and true tone.

## SOME NEW EXCHANGES.

STAUNTON, VA.—The Long-Distance Telephone Company has been incorporated to operate a telephone line, with a capital stock of $10,000, by J. R. Kemper, W. H. Laughlin, F. M. Hanger and others.

WAYNESBORO, VA. — Waynesboro Mutual Telephone Company has been incorporated to operate a telephone line. The capital stock is $5,000, and the incorporators are W. Patrick, N. C. Watts, both of Staunton, J. F. Carr, of Waynesboro, and others.

STURGEON, MO.— The New Century Telephone Company has been incorporated, with a capital stock of $10,000, by O. D. Gray, T. R. Morris, W. Seymour and others.

NEW AUGUSTA, IND. — The New Augusta Telephone Company has been incorporated, with a capital stock of $10,000. The directors are M. J. Wagle, J. Harcourt, G. T. Avery and others.

FALLS CHURCH, VA.—The Falls Church Telephone & Telegraph Company has been incorporated to conduct a general telephone and telegraph business, with a capital stock of $5,000. The incorporators are M. E. Church, B. E. Williams and others.

STEVENS POINT, WIS.—The Wisconsin River Telephone Company has been incorporated here. The capital stock is $25,500, and F. L. Dille and J. Reton are the incorporators. The company will be coöperative and operate a local exchange in connection with the Wolf River toll line.

MCKINNEY, TEXAS. — A new telephone company has been organized here. J. B. Roy, of Bates, Denton County, is manager. The directors are A. T. Robertson, J. Bryan, W. A. Rhea and others. The line will run from Bates via Parvin, Celina, Vineland, Roland, Rhea Mills to McKinney. Material is on the ground and the work commenced.

HOWE, TEXAS. — The Howe Telephone Company, of Howe, Grayson County, has been incorporated, with a capital stock of $600, to construct and operate telephone lines between Howe and Tom Bean, Jameson, Farmington, Morgan Grove and Elm View, all in Grayson County. The incorporators are W. L. Higginbotham, G. H. Baxter, J. H. Thompson and others.

KINEO, ME.—The Kineo and North East Carry Telephone & Telegraph Company is extending its new line to the head of Chesuncook Lake, fifty miles in the wilderness of Maine. The work will be completed by August 20. The line is now working between Kineo, the northeast and the northwest carries, and the Penobscott house on the west branch of the Penobscott river.

Digitized by Google

# Telephone Magazine

THE ONLY INDEPENDENT TELEPHONE PAPER IN THE WORLD.

MARQUETTE BUILDING,
TEL. CENTRAL 2541. CHICAGO.

Published on the 15th day of each month.

**Electrical Engineering Publishing Co.**

JOHN C. McMYNN, PRESIDENT.
C. E. KAMMEYER, EDITOR.

**SUBSCRIPTION:**

| | |
|---|---|
| One year, United States and Canada | $1.00 |
| One year, foreign countries | 1.50 |
| Single copies | .10 |



**COPYRIGHT:**

The title and contents of this paper are covered by a general copyright. Permission from publishers must be obtained before any article or table is copied, or any illustration reproduced.


CHICAGO, SEPTEMBER 15, 1900.

IN this issue of THE TELEPHONE MAGAZINE we present our readers with the second article on "Telephone Switchboards," by the well-known telephone engineer, Mr. H. P. Clausen. Having given the reader a general idea as to the requirements of a switchboard equipment for central office systems, the author now follows with a set of general specifications of a switchboard and telephone equipment, in order to aid those contemplating the building or reconstruction of a telephone plant to come to some intelligent conclusion as to how the exchange should be built. We do not believe that many attempts have ever been made in the construction of smaller or medium-sized exchanges to go according to some definite preconceived plan, and if the adaptation of some general specifications could be done, it would, undoubtedly, result in a more uniform and efficient service. Local conditions would, of course, necessitate some changes in the details of the equipment.

## INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS.

The fifth annual meeting of the International Association of Municipal Electricians will be held in Pittsburg, September 25, 26 and 27, and will be the most profitable and interesting assemblage that has occurred in the history of the Association. Pittsburg, "the workshop of the world," as it has been justly called, has the leading electric manufacturing works in this country, employing daily over 4,500 persons, and this of itself insures the delegates and their friends a world of interest, to say nothing of the thousands of other works and industries of all kinds located here.

Arrangements have been made with the American Bell Telephone Company and the Pittsburg Central District and Printing Telegraph Company for the free use of those companies' telephones to the delegates and their friends during the convention, and also with the Western Union and Postal Telegraph and Cable Companies for the free services of their wires during that time. It is also expected that the railroad companies will arrange to issue to the delegates and their friends a one-and-a-third fare from all points, on the certificate plan, and arrangements have been made at leading hotels for the accommodation of all guests at reasonable rates.

By way of entertainment on the evening of the first day of the convention (September 25), a trolley ride on special cars of the Consolidated Traction Company, The United Traction Company, The Monongahela Traction Company and The Pittsburg and Birmingham Street Railway Company has been arranged. The route laid out over the lines of these companies is many miles in length, and passes thru the most beautiful, picturesque and historic scenes in this country.

During this trip luncheon will be served at Kennywood Park, one of the most beautiful places for the purpose on the route laid out. In fact everything possible to make this ride one of the

Digitized by Google

most enjoyable events of the meeting has been planned.

An excursion and banquet on the steamer Mayflower on the afternoon and evening of the 27th on the Ohio and Monongahela rivers has also been arranged.

The Western Pennsylvania Exposition of Industrial Arts will open at the time of the meeting, and special arrangements will be made for the delegates to attend in a body.

The Central Passenger Association has made a reduced rate of a fare and one-third for the round trip, on the certificate plan, to those attending the convention.

## AMERICAN STREET RAILWAY ASSOCIATION.

The nineteenth annual meeting of the American Street Railway Association will be held at "Convention Hall," Kansas City, Missouri, October 16, 17, 18 and 19, 1900.

Papers will be read on the following subjects:

Double Truck Cars; How to Equip Them to Obtain Maximum Efficiency Under Varying Conditions.

Comparisons of the Various Systems of Electrical Distribution for Street Railways.

Consolidations of Street Railways and Its Effect upon the Public.

The Storeroom and Storeroom Accounts.

Painting, Repainting and Maintenance of Car Bodies.

There will be a large exhibition of street railway supplies.

Friday, October 19, has been set apart as a day for the examination of the exhibits. No session of the association will be held, so that all may have plenty of time to view the exhibits. It is earnestly requested that managers have their heads of departments present on that day.

The annual banquet will be held at the Coates House, Friday evening, when the officers elect will be installed.

The headquarters of the association will be at the Midland Hotel.

---

"I could not do without THE TELEPHONE MAGAZINE. It ought to be read by all who are interested in telephony."

A. L. LEE.

## AMERICAN ELECTRIC FUSE COMPANY'S EASTERN OFFICE.

Owing to the rapidly increasing Eastern business this company has been obliged to open offices and stockrooms at 116 Nassau street, New York, where Mr. W. B. McCurdy will be in charge. Mr. McCurdy has been connected with the company for several years and is thoroly versed in everything pertaining to the business. A full and complete stock of all goods manufactured or handled by the American Company will be carried at the New York office and shipments will be made from there direct to customers giving orders to the New York office. This will save both time and money to the customers, as orders can be filled immediately from New York which would take several days to fill from Chicago, and will furthermore save freight and express charges on Eastern shipments. The prices will remain as low as before. Mr. McCurdy will be very pleased to see any of the trade at the offices, No. 116 Nassau street, New York, N. Y. and will devote his entire time and attention to the management of the business there.

## THE KELLOGG CATALOGS.

Bulletin No. 1 just issued by the Kellogg Switchboard and Supply Company, Chicago, is an attractive twenty-page circular, describing the various articles of telephone apparatus manufactured by the company. The pamphlet is illustrated with about fifteen half-tone cuts, and describes in detail the various parts of a telephone, and also the numerous types of completed 'phones manufactured by the company, adapted to all kinds and conditions of service. Receivers, transmitters, transmitter arms, the hook-switch, magneto generators and the ringer are in turn discussed and their extensive line of standard series exchange and bridging-bell toll-line 'phones and desk and cabinet 'phones is also described. The principles of the Kellogg divided exchange and the 'phones particularly adapted for common battery work are also enumerated. This booklet is a departure from the usual form of circulars of a similar nature published by

Digitized by Google

other companies, in that it gives real information concerning the articles discussed, and will be found interesting alike to the exchange manager and casual reader.

Another handsomely gotten up descriptive and illustrated pamphlet sent out by the Kellogg Company pertains to the history, methods and facilities as well as the products in general of this company.

---

### AMERICAN BATTERY COMPOUND.

The widespread use of the zinc-carbon couple for battery cells makes a few words on its installation and maintenance of interest to those who use open circuit batteries. Sal ammoniac has long been

the only chemical that was found to give even fair results in these cells, yet the insoluble crystals deposited on the elements by the solution, when spent, have always been a source of serious loss, while the creeping salts often did great damage to the surroundings and corroded the terminals of the cells.

Prior to the invention of the American Battery Compound, says its manufacturer, nothing commercially practical had been discovered to supersede the use of sal ammoniac in zinc-carbon cells. This American compound is offered to the public as a chemical compound that is far superior to sal ammoniac; it is said that with its use no creeping salts are produced, and that its phenomenally long life reduces the cost of maintenance and inspection to a minimum.

The slow polarizing properties of the compound, it is claimed, make it a superior battery salt for telephone work as well as any service requiring a small quantity of current for an extended period. On long-distance instruments that are in constant use, batteries charged with it are asserted to be nearly equal to the Fuller cell for constancy, while they excel it for long life and cleanliness. The adoption of this compound will enable exchange managers to increase the efficiency of their plants by decreasing the cost of inspection and battery materials.

The solution in batteries charged with American compound has no tendency to creep or crystallize out on the edges of the cells or the elements where they enter the liquid, and thus the terminals of the cells are not destroyed by corrosion and there is no danger or damage to the surroundings of the cells. This permits of the cells being placed anywhere with perfect safety.

The accompanying illustration shows the neat cardboard box containing the compound. This package (4 by 2 by 1½ inches, actual size), contains one full charge of battery compound for the standard size of sal ammoniac cell, and, it is said, will energize it for from two to three times as long as a similar charge of sal ammoniac. The compound, so it is claimed, does not undergo any chemical change in any climate nor does it deteriorate with age; hence any quantity can be carried in stock. It is packed in cases containing 50, 100 or 150 charges, as desired, and is manufactured by the American Battery Compound Company, No. 224-226 South Clinton street, Chicago.

---

GLENN SPRINGS, S. C.— The Secretary of State issued a commission to A. C. Gates, B. C., H. L. and H. O. Simpson, as incorporators of the Glenn Springs Telephone Company, which proposes to connect the springs with points in Spartansburg and Union counties by 'phone. The capital stock is to be $500.

Digitized by Google

## DEVELOPMENT OF THE TELEPHONE.*

BY EDWARD L. BARBER.

The telephone, as we know it today, is a product of the last quarter of a century. When first placed upon the market, few people had the slightest idea of the important part it would play in the business and social life of the people. It was generally considered but little better than a toy, and for a number of years subsequent to the granting of the patents covering its important features, it did not come into anything like general use. As soon as its utility was recognized it passed into the hands of a corporation which waxed wealthy and grew corpulent from the money exacted from those who were, perforce, compelled to pay whatever sum was demanded for the service. During the time this state of affairs existed, or up to the year 1895, when the independent movement got fairly started, there were comparatively but few telephones in use, the monopoly believing the telephone to be a luxury and for the few, charging such rates that it was impossible for the many who desired to indulge, but in this year, when several of the basic patents expired, so that whoever desired could manufacture and use the telephone, then was recorded the birth of the independent telephone organization, which has grown to such magnificent proportions as to cause the assembling of such a convention from the four corners of this vast country as we are here enjoying.

Then it was discovered that just as good, if not better, apparatus could be manufactured by the independents as was in use by the monopoly, and factories were started, at first only two or three, but as the demand increased more were added, until now there are some fifty or more in the manufacture of telephones and switchboards alone, to say nothing of the many other branches of the industry; and I am told by the people of this branch of the industry, that the demand for their goods is increasing so rapidly that it is almost impossible for them to supply it.

At the time of the advent of the independent movement, had those who were in possession of the telephone interests of this country been disposed to be half-way fair with the people, the independent telephone movement would never have been born, and those of us who are here assembled today would never have had the pleasure of communing with each other, nor the experiences we have had since we engaged in this line of human endeavor. But they were not so disposed. They seemed to believe that they had everything their own way; that the telephone was invented only for the rich of the populous centers of the country, and by their acts of exclusion deprived nine-tenths of the population of our country the privilege of enjoying this greatest of modern improvements. The man of moderate means could not afford to pay the exorbitant prices charged, and even those of wealth, who could afford it but who chanced to live outside the larger cities, were likewise denied the boon they sought.

The advent of the independent telephone movement, however, changed all this and within the past five years the movement has taken such strides that nearly every village of the land is connected with the great outside world by one or more telephone lines, and the homes of multiplied thousands of those residing on farms far distant from the centers of population enjoy the same benefits on this line as do their heretofore more favored city cousins. The telephone is no longer a luxury to be enjoyed by the rich, or those whose business interests compelled them to pay whatever price the monopoly demanded for its service, but it has become as everyday a necessity to the home as the cook-stove and as essential to the business-office as the desk or typewriting machine. All this has been brought about by the movement which we represent and there are some of us here who are vain enough to think that we had something to do with the shaping of this most desirable result.

Again, we refer to the apparatus we

* Read before the Independent Telephone Association, at Cleveland, June 13, 1900. Mr. Barber is president of the Central Construction Company, of Wauseon, Ohio.

Digitized by Google

use. When the first independent exchange was constructed, the monopoly laughed long and loud, and indeed, there was some reason for their hilarity. The apparatus used was crude and inefficient, all of the basic patents had not expired and the earliest independent exchanges were compelled to use instruments without a battery attachment and it was soon discovered that such equipment was inadequate and could not fill the bill. But the day came when the last of the patents ceased to be prohibitive and then the monopoly changed its tune and has been changing it until today it is a most dismal dirge that is wafted over the land from the scene of previous rejoicing down on Milk street in "Old Boston Town."

Today we surpass them in number of exchanges in operation and in the number of points reached, and in the territory between the Allegheny and Rocky Mountains in the number of instruments in use, and have an equivalent in every respect superior to that used by the monopoly, and they are taking lessons from us in the construction of telephone plants.

Our instruments (and I do not refer to any particular manufacturers' output, for there are a large number of really excellent instruments on the market today, made by as many different houses) are fine specimens of mechanical skill and workmanship and fulfil to the letter all the demands made by an exacting public upon them and are today giving better service in a thousand towns and cities thruout this broad land than are the instruments of that monopoly which has repeatedly informed the people that we do not know how to build telephone plants, do not know how to operate them and are unable to secure either telephones or switchboards which will stand the test of service.

But the people have learned some important lessons along the telephonic lines during the four years which are covered by the history of this independent movement. They have learned that we are their friends and that whatever we tell them they can rely upon, while the wild statements of our adversaries have been, time and again, proven false. They have learned that, if they want the best service, the most accommodating service, they must come to us, and that it is to our efforts that must be credited the fair prices that predominate, and that to us belongs the credit of making the telephone what it is today — a blessing to all people everywhere.

Now a word as to statistics in the movement. I think most of us are familiar with what was done up to the meeting of our Association last June in Chicago. Today we have, as near as I am able to ascertain, about three thousand exchanges with a total number of 1,000,000 telephones and many thousand toll lines, so you see we have increased even more rapidly than in any previous year, and that the independent development of the telephone is by no means at a standstill. Since we have thus succeeded, my idea is that we should still continue the same policy; continue to avoid the mistaken idea of the original company that the telephone was for the few; to give the best possible service at the least possible cost; to avail ourselves of a practically unlimited demand, and to so conduct our affairs that our patrons will regard our interests and theirs as identical and equally deserving of consideration. Even now the use of the telephone is in its infancy when we consider what has been done in the past few years. Its growth has only begun. Ultimately the telephone will be in every home as a convenience, a time and money saver, and a "necessity" in the ordinary affairs of men.

---

ABOUT "WESTERN APPARATUS."— In one of the Trade Notes of the August issue it was stated that some switchboards shipped by a local manufacturer were to replace Western apparatus. The Western Telephone Construction Company states that the boards referred to were made by the old Western Company, and nothing like the new high-grade apparatus of the reorganized company.

Digitized by Google

## RECENT PUBLICATIONS.

"In the type-case of the printer, all the wisdom of the world is contained, which has been or ever can be discovered. It is only requisite to know how the letters are to be arranged. So, also, in the hundreds of books and pamphlets which are every year published about ether, the structure of atoms, the theory of perception, as well as on the nature of the asthenic fever and carcinoma, all the most refined shades of possible hypotheses are exhausted, and among these there must necessarily be many fragments of the correct theory. But who knows how to find them?

"I insist upon this in order to make clear to you that all this literature, of untried and unconfirmed hypotheses, has no value in the progress of science. On the contrary, the few sound ideas which they may contain are concealed by the rubbish of the rest; and one who wants to publish something really new — FACTS — sees himself open to the danger of countless claims of priority, unless he is prepared to waste time and power in reading beforehand a quantity of absolutely useless books, and to destroy his readers' patience by a multitude of useless quotations."—HELMHOLTZ.

THE STEAM ENGINE AND GAS AND OIL ENGINES. By John Perry. 646 pp., 6 by 8½ inches. Cloth. London: Macmillan & Co. New York: The Macmillan Co.; 1900. Price, $3.25.

In writing upon the title-page, "A book for the use of students who have time to make experiments and calculations," the author strikes the keynote of his elaborate treatise on "The Steam Engine." In the very beginning — in the preface — the reader is cautioned against accepting statements on faith, and strongly advised to verify them experimentally. Stress is laid also upon the distinction between passive and active studying in the endeavor to induce the student to make what he reads his own. This is certainly good advice for these days of indifferent and cursory reading. On the other hand, it is not always possible for the general scientific reader to do sufficient experimenting to establish indelibly the facts and principles which he encounters. The same difficulty, of course, does not confront the principal class which the author addresses — students of applied science — for all well-appointed technical schools now have the apparatus required for such experimental work as is indicated in The Steam Engine.

The author does not hesitate to use mathematics when necessary, altho the general treatment of the subject is not mathematical. After having digested his "calculus" and applied "mechanics," mathematics has no terrors for Professor Perry's pupils, nor should it for a well-equipped engineer. After all, as the author remarks, engineering is only the utilization of scientific principles — mathematical, physical, chemical, and it is refreshing to a scientific mind to observe how he has woven these together in his latest literary production, always in that delightful conversational style which so marks Professor Perry's work.

The book is divided into thirty-five chapters, the first ten of which are devoted to a most satisfactory description of the commonest forms of steam engine, the various details and mechanical contrivances accessory to them, and to a clearly intelligible explanation of their workings. Four chapters are given to boilers and their fittings, construction and heating arrangements, the most prominent modern types being illustrated; altho the old-time Cornish and Lancashire boilers are not forgotten.

As a prelude to the more theoretical parts of the work there is inserted a chapter on numerical calculations, as an assistance to the reader in the use of logarithms, rates of increase, and so on to follow. The inclusion of such a chapter in a book to be used by "practical men" is a wise forethought and will be much appreciated.

The hypothetical diagram and properties of steam and gaseous fluids are treated in well-considered chapters containing many valuable tables and other information, after which the reader is introduced to the subject which has proved the specter, to the engineer, of the modern treatment of the steam engine — entropy. The author seeks to make clear the physical significance of the term by analogy, and as a further help introduces a unit with which to measure it — the *rank*, an honor to the master who first used the symbol $\phi$ to represent what we now call entropy. As the name of the quantity is closer to it than the letter which stands for it, why not call the unit the *claus*? It would not sound so badly. It is to be confessed that Professor Perry has not cleared up the subject as one might have expected him to. It is at best a difficult thing to understand.

Other noteworthy chapters are on cylinder, condensation, combustion and fuel, boiler efficiency, and valve-motion calculations, and the inertia of moving parts, the latter of which subjects are treated pretty exhaustively. The growing uses of the gas and oil engines merit the extensive notice which the author gives

Digitized by Google

them; this part of the book will be read with particular interest by those who have not carefully followed the development of these important types of prime movers.

"Thermodynamics," "superheated steam," "how fluids give up heat and momentum" and "jets of fluid" are the titles of the chapters which round out a well-written book.

The typography and make-up of the work, it is almost unnecessary to state, are excellent. The illustrations are clear cut and mostly new. A commendable feature about them, when of apparatus, is a description of the parts, on the same page as the illustration, thus avoiding tiresome cross references between pages. The book is filled with examples and exercises of various kinds which, in connection with the thoro and logical treatment accorded the many topics touched upon, will make it an invaluable text-book for class-room work. It is more than this — it will be found a ready and satisfactory guide to the working engineer, not sacrificing accuracy of statement and method to short-cut results, but presenting its subject-matter in so compendious and yet so full and careful a manner as to preclude the possibility of false conceptions on the part of the reader; for this reason it should be in the possession of every one interested in the steam engine.

ELECTROMETALLURGIE UND GALVANOTECHNIC. EIN HAND-UND NACHSCHLAGEBUCH FÜR DIE GEWINNUNG UND BEARBEITUNG VON METALLEN AUF ELECTRISCHEM WEGE. Von Dr. Franz Peters. In four volumes: First volume. Die Halb-und Leichtmetalle. 261 pages, 72 illustrations, paper uncut; price, 3 marks. Second volume. Kupfer. 292 pages, 119 illustrations; price, 3 marks. Third volume. Edelmetalle. 208 pages, 59 illustrations; price, 3 marks. Fourth volume. Zink, Blei, Nickel und Kobalt. 240 pages, 33 illustrations; price, 3 marks. A. Hartleben's Verlag, Wien, Pest und Leipsic.

Probably many of our readers will remember the work by the same author on applied electrochemistry reviewed in these columns sometime ago. The work before us is of a similar character, but treats of a different subject. The discussion not only comprises electrical processes for the treatment of ore that were or are of commercial value, but also gives those processes that have been invented and patented but were not considered of enough practical use to give them a trial. The author's object in publishing such processes, no doubt, was not merely to give a complete record of all inventions made in this field, but also to offer an opportunity to select from among the impractical methods the most favorable points, which might in some instances urge the investigator to new discoveries.

The work treats of the following metals: Antimony, tin, bismuth, beryl, magnesium, aluminum, copper, silver, gold, zinc, lead, nickel and cobalt.

Naturally, the patent-office records are the principal source of information, and much credit is due to the author for arranging the patent matter in such a way that his book becomes a great saver of time and labor. He not only gives the number and date of patent, but also inserts after the description of the system the principal claims of the inventor.

In many cases, where a process has been used commercially, the author gives some data about the power and machinery installed by various companies using different processes, and compares the results obtained by giving the cost of operation. Undoubtedly, such valuable data must be difficult to obtain, and it seems rather surprising that the author has been able to give so much information regarding cost of operation as he did.

TECHNISCHE LEHRHEFTE. DIE MASCHINENELEMENTE VON H. KORN. 103 pages, paper cut; price, 5.40 marks.

DIE KRAHNE. I THEIL. GESTELLE DER KRAHNE VON P. ZIZMANN. 46 pages, paper cut; price, 2 marks. Hildburghausen.

Both monographs are of a didactic nature, and are composed by the authors for the special purpose of serving their students at the technical college as a text-book. The execution is most elaborate, altho the subject matter is held within proper limits. The drawings, principally in the "Machine-elements" are magnificent, giving not only full dimensions, but are also colored, using the color code adopted by most German technical institutions. The formulæ deduced in the text are concise, and their application is amply illustrated by examples.

The sketches in the "Cranes" involuntarily recall Rieder's Skizzen, which has become a classic, and should be possessed by everybody interested in this subject.

The study of these books is not made difficult by mathematics, no knowledge of higher mathematics being required. The principal merit lies in the method of treatment; a few words tell many facts, the illustrations do the rest.

Digitized by Google

# INDEPENDENT ITEMS.

HAGERSTOWN, IND.— A company has been organized in this town to put in a local telephone exchange.

LEWISBURG, OHIO.— The Lewisburg Telephone Company has been incorporated, with a capital stock of $1,500.

FREDERICKSBURG, VA.— The Louisa Telephone Company has nearly completed its line from Gordonsville to Liberty Mills in Orange County.

PIEDMONT, W. VA.— The Rio Telephone Company of Hampshire County has applied for a charter and is building a line from Rio to Romney thru the Grassy Lick country.

BROOKVILLE, KY.— The Brookville & Milford Telephone Company has been incorporated, with a capital stock of $1,000, by J. A. Downard, of Covington, and J. B. Beckett, of Brookville.

ERIN, TENN.— The Houston County Telephone Company will construct and operate telephone lines. The capital stock is $2,500, and the incorporators are J. M. Gooly, W. R. Boone and others.

WILLIAMSBURG, KY.— An independent telephone company has been organized at this place. It is known as the Whitley Telephone Company, and is backed by some of the best citizens of the town.

SHERMAN, TEXAS.— A company has been organized here for the purpose of putting in another telephone system to be operated in Sherman and Denison. The company will be organized with a capital stock of $500,000.

CORTLAND, N. Y.— The Cortland Home Telephone Company has filed articles of incorporation. The capital stock is $75,000, and the directors are C. D. Ven Nooy, W. H. Jones and C. J. Mager, of Cortland.

BERMIDJI, MINN.—The Bermidji Telephone Exchange Company has been incorporated to conduct a telephone exchange. The capital stock is $10,000. J. H. Haner, A. D. Stephens and others are the incorporators.

FILLMORE, N.Y.—The Fillmore Telephone Company, of Fillmore, Allegheny County, has been incorporated, with a capital stock of $5,000. The directors are C. Ricker, W. S. Mills and J. H. Howden, of Fillmore.

NEW LONDON, OHIO.— The Farmers' Telephone Company has been organized to construct and operate telephone lines. The capital stock is $2,000. The incorporators are C. Peck, A. H. Collins, H. W. Townsend and others.

CAMDEN, TENN.— The Venton Telegraph Company, Camden, has been incorporated to construct and operate a telephone line. The capital stock is $2,000, and the incorporators are G. W. Baker, H. A. Caraway and others.

NEW CONCORD, OHIO.— The New Concord Telephone Company has been incorporated to construct and operate a telephone line. The capital is $10,000, and the incorporators are L. I. Graham, O. M. Shipley and S. W. Loemer.

CLEVELAND, OHIO.— The Pioneer Telephone Company has been incorporated, to construct and operate telephone lines. The capital stock is $8,000, and the incorporators are L. A. Beard, C. A. Kerr, F. J. Hadley and others.

LAKE CREEK, TEXAS.— The Southern Telephone Company, of Lake Creek, Delta County, has been incorporated, with a capital stock of $2,000. The incorporators are R. W. Miller, W. W. Thompson, J. C. Hendricks and others.

DIXIE, TENN.— The Secretary of State has granted a charter to the Dixie Telephone Company, of Benton County, with $1,500 capital stock. The incorporators were J. F. Dowdy, N. A. Potts, W. P. McGill, R. G. Hudson and others.

OTISCO, N. Y.— The Otisco & Cedarville Telephone Company, of Otisco, has

Digitized by Google

been incorporated to operate a telephone line from Otisco to Syracuse. The capital stock is $15,000, and the directors are H. D. Pomeroy, I. W. Bardwell and others.

CEDARVILLE, OHIO.—The Cedarville Telephone Company has been incorporated to construct and operate telephone lines. The capital stock is $15,000, and the incorporators are D. Bradfute, O. E. Bradfute, J. H. Andrew, F. B. Trumbell and S. B. Rankin.

GUTHRIE, OKLA.— The Guthrie Telephone Company has been granted a franchise by the city council to erect and maintain a telephone system in this city. This is virtually the same company a franchise in whose behalf was vetoed by the mayor a short time ago.

SUMMIT, OHIO.— The Summit Telephone Construction Company, with a capital stock of $5,000, has been incorporated by Akron men. The incorporators are W. A. Green, L. S. Foltz, W. A. Shafer and others. The company will have its headquarters in this city.

LOCKPORT, N. Y.— The Home Telephone Company, of Lockport, has been incorporated to construct and operate a telephone line connecting the principal points in the county of Niagara. The capital stock is $125,000, and the directors are M. B. Butler, G. H. Frost, of Buffalo, and E. A. Lord.

DANVILLE, ILL. — The Perryville Telephone Company has completed the arrangements for the construction of a line from that village to Gessie, and work has already been begun. The directors of the company are talking of extending their line from Perryville to Rileysville, and from there to this city.

CHARLESTON, S. C.— The Sea Island Telephone Company has been incorporated, with a capital stock of $10,000, to construct telephone lines and systems connecting Charleston with the several sea islands on the coast. The incorporators are F. W. Fowler, of Madmalaw Island; N. Blich and W. C. Geraraty, of Young's Island; C. Bissell, Jenkinsdof, Charleston, and others.

NACOGDOCHES, TEXAS.— Some of the strongest men financially in this town have organized a telephone company for the purpose of building a line from here to Beaumont, on the Texas & New Orleans Railroad extension, and from here to Houston. The right of way has been secured, and the company will begin stringing wires soon. A sufficient force will be employed in construction to reach Beaumont by the middle of July. The line to Houston will be in operation in about a month.

PITTSBURG, PA.— The West Penn Long-Distance Telephone Company has been chartered at Harrisburg, with a nominal capital of $10,000. The company is composed of the same people that control the Pittsburg & Allegheny Telephone Company. As the charter of the latter company does not give it the right to operate outside the county, the long-distance company was organized. The directors are H. A. Parr and S. H. Brown, of Baltimore; W. D. Evans, R. W. Spring and W. W. Handy, of Pittsburg.

VERNON, N. Y.— The Home Telephone Company of Rome is constructing a line via Rome, Farwell and Tilden Hill to Oneida. A firm of contractors of Pennsylvania has a contract and is doing the work, a gang of men having reached Tilden Hill with poles today, and it is expected the line will be in operation in two months. The company has an exchange at Rome and at Oneida connecting with the Syracuse Telephone Company, which has an exchange there. The company promises extensive privileges and furnishes all the subscribers with long-distance 'phones.

WICHITA, KAN.— Work has been commenced on the long-distance telephone between this city and Oklahoma City. Three gangs of men are at work on this line and the construction will be rushed very rapidly, as this line is very badly needed by the Missouri-Kansas Company. At the present time the long-distance business from the South is carried over one line, and this method has been very unsatisfactory to the company, as the business at times was too large to be handled. It has been decided to give a telephone exhibition at Wellington within the next few weeks.

Digitized by Google

# MONTHLY DIGEST OF TELEPHONE AND KINDRED PATENTS

EDITED BY EDWARD E. CLEMENT.

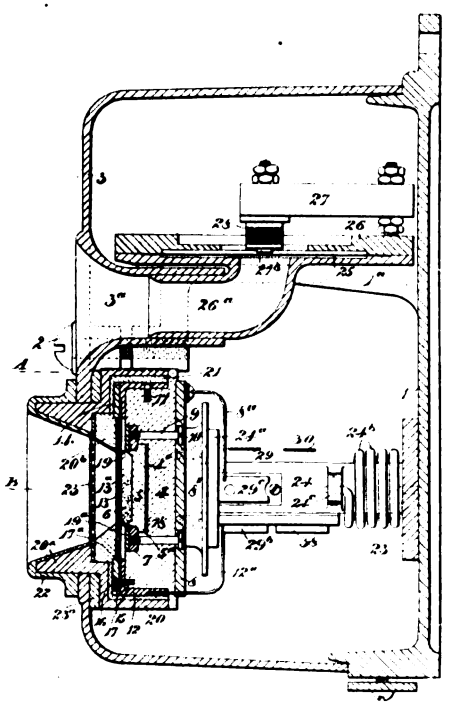
Copies may be had, postage paid, by enclosing 10 cents for each one. Address inquiries in care of this magazine or to McGill building, Washington, D. C.

*August 7.*

No. 655,620.—A. GRAHAM. TELEPHONIC APPARATUS.

This is a weatherproof box containing a transmitter receiver and calling switch, together with a circuit therefor.

The box is in two parts, of metal, the back 1, and the cover 3, the latter fitting closely all around. Within the box the



655,620. TELEPHONIC APPARATUS.

receiver 27 is mounted on a bracket 1*a*, the pole pieces of its magnet 27*b*, and its diaphragm 25 lying at the inner end of a funnel leading to the outside of the box. The parts of this funnel are telescopic and so arranged that condensed moisture will run out.

The transmitter is of the granular type and is shown at B. 4 is a fiber block, 5 is a carbon back electrode, 6 is granular carbon, 13 is an inner diaphragm and 13*a* is an overlying metal diaphragm; the parts 8, 20 and 22 all being of metal, and all the joints so designed as to exclude moisture. A perforated plate 23 covers the diaphragms, and the whole transmitter has an external lever handle to turn it with its spindle 24, the latter carrying contacts 29*b* and 38 to engage overlying springs 29 and 30, making first a ringing circuit to battery and ground, and then the talking circuits as the handle is turned. In conversation, the transmitter at one end and the receiver at the other are connected thru one of the pair of wires, and the receiver at the first end and transmitter at the other thru the second of the pair, the two wires of a metallic circuit being thus used as two separate-grounded circuits.

No. 655,651.—ERNEST A. FALLER. MULTIPLEX TELEPHONY.

This invention contemplates a multiplicity of conversations simultaneously carried on over a single circuit. It consists essentially in causing the instruments that are to be used together to agree or be tuned as to their electrical conditions when they are brought from their condition of inactivity into use and at the same time causing certain adjustments to take place in all the instruments which are not wanted, so that upon the next pair of instruments being brought into use their electrical conditions, while mutually harmonizing, will differ from those of the pair already in use; and this action takes place in respect of the idle instruments whenever another new pair of instruments is brought into use.

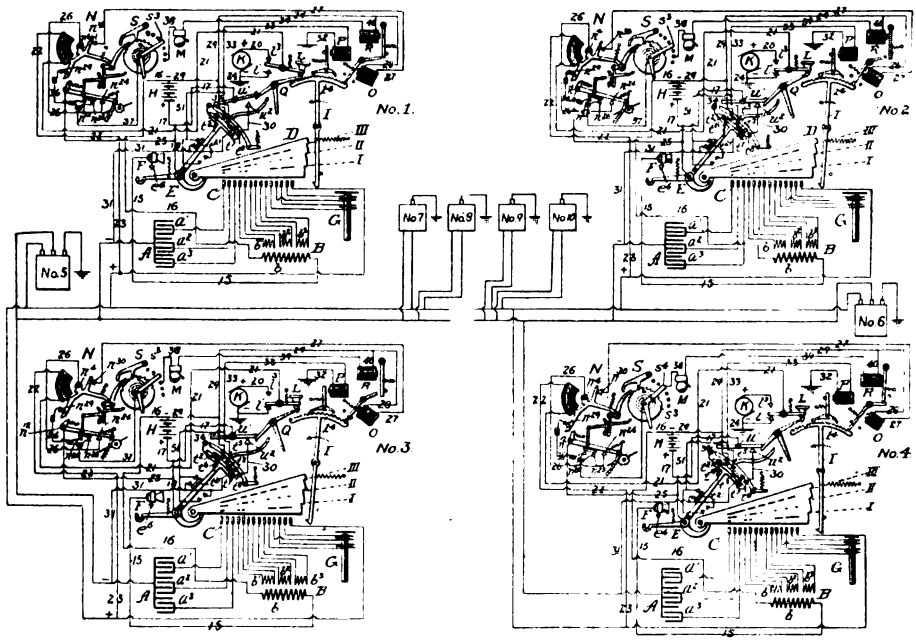
Any idle instrument at one end of the line can establish communication with an idle instrument at the other end while a conversation is being carried on between the active instruments. This is accomplished by providing the several branches leading from the terminals of the line with condensers whose capacities may be varied or adjusted, induction coils

Digitized by Google

the electrical condition of whose secondaries may be changed by bringing in more or less turns, and receivers provided with double windings capable of being worked in series or multiple. By means of a suitable switch the windings of the receiver are connected in multiple or in series, said switch simultaneously reducing or increasing the capacity of the condenser and the number of turns in the induction coil secondary in the ratio of say one to two or one to three and thus changing the conditions of the tions exist, will cause the receiver to respond, while a current emanating from a station in whose instruments different connections and conditions exist will leave the said receiver silent, or practically so.''

The conditions possible to be obtained are stated as follows :

First condition : One-third of the condenser is in series with one-third of the secondary winding of the inductorium, which is in series with the coils of the receiver, which individually are con-




655,651. MULTIPLEX TELEPHONY.

instrument both as to capacity and self-induction.

The inventor says : ''The active surface of the condenser, the number of turns in the secondary coil of the inductorium, and the windings of the receiver are proportioned in such a way as to cause the latter (the receiver) to respond only to a current of a certain tension and amperage. For instance, if the switch is in such a position as to connect the windings of the receiver in series and the entire surface of condenser and winding of the secondary in circuit, a current, coming from a station in whose instruments like connections and conditions exist, will cause the receiver to respond, while a current emanating from a station in whose instruments different connections and conditions exist will leave the said receiver silent, or practically so.''

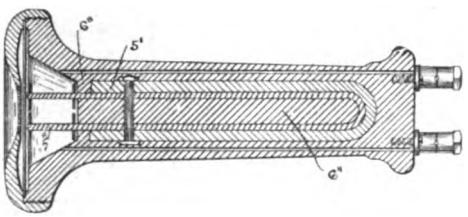
The conditions possible to be obtained are stated as follows :

First condition : One-third of the condenser is in series with one-third of the secondary winding of the inductorium, which is in series with the coils of the receiver, which individually are connected in multiple and are collectively in series with the line. Second condition : Two-thirds of condenser is in multiple, connected with two-thirds of the windings of the inductorium, which windings are in series with each other and are connected in series to one-half of the winding of the receiver which is connected to the line. Third condition : All the three sections of the condenser in multiple are connected to the windings of the secondary coil of the inductorium, which are individually in series and connected to both receiver-windings, which are in series and which are connected to the line. The other side of the condenser is

Digitized by Google

permanently connected to the other branch of the line.

The entire system is one depending upon electrical resonance for its operation, and a predetermined order of successive "tunings," instead of a fixed set



655,726. TELEPHONE RECEIVER.

of resonant circuits. There are thirteen pages of description in the patent, and thirty-nine claims.

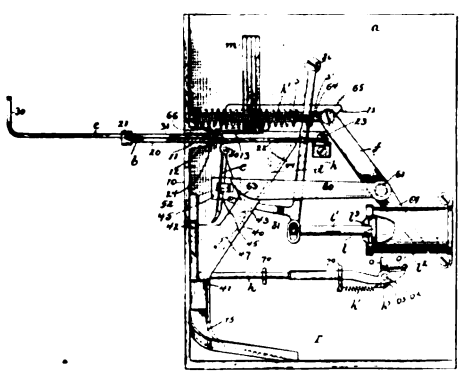
*August 14.*

No. 655,726. — W. J. MURDOCK. TELEPHONE RECEIVER.

In this receiver the shell is molded directly upon the metal parts, such as the magnets, binding posts, etc., so that, in effect, a solid body is produced having the working parts embedded in it.

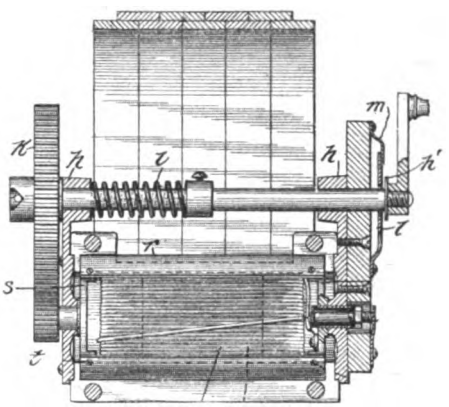
No. 655,772. — W. A. FOSS. TELEPHONE TOLL APPARATUS.

This is a rather complicated piece of apparatus, which accomplishes three things: It selects out any false tokens of magnetic metal, such as iron or steel slugs or the like; it sounds a buzzing



655,772. TELEPHONE TOLL APPARATUS.

clockwork to tell the listening operator that the coin or token is deposited; and it permits the last deposited coin to remain on view before final deposit, so as to settle disputes. A slide C has an aperture to receive the coin, and when the slide is pushed in it pushes back a lever *f* thru the medium of arm 64, thus raising rigid arm 60, to permit gate *e*, of the hopper, to close down on shoulders 43, between which and the gate the coin then lodges as it falls, flatwise. The gate has a hole in it, and thru this finger 81 would normally pass without effect, but when the coin has dropped onto shoulders 43 it rests over the hole in the gate, and on return of finger 81, on lever *k* (pushed back also by the slide), it will push coin and gate, to open the latter, and to thereby release the escapement



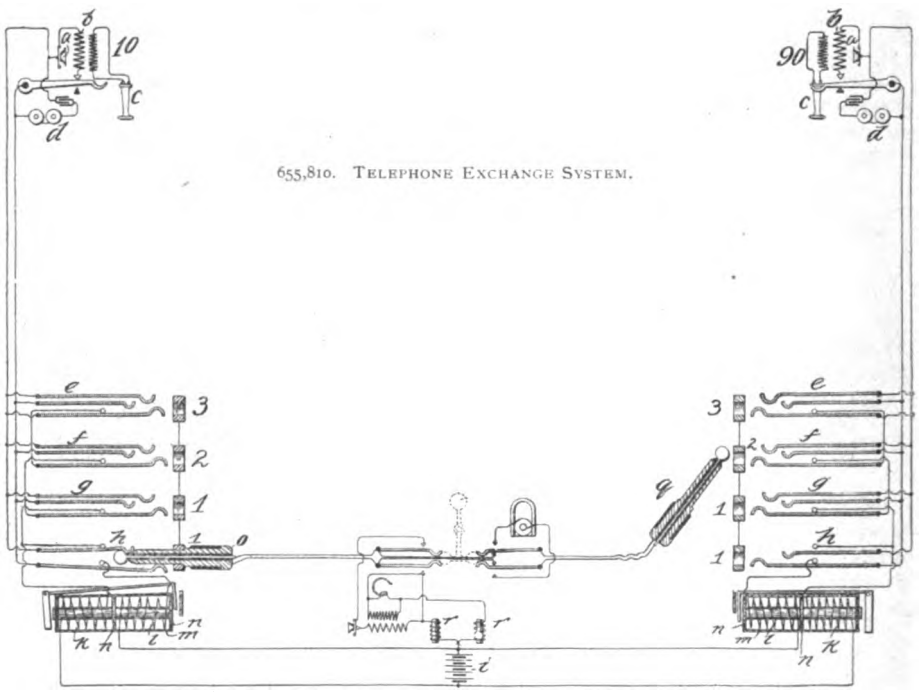
655,809. SIGNALING APPARATUS, AND CIRCUIT THEREFOR.

of a clock movement actuated by a spring on shaft 61, wound when lever *f* is turned. This clock movement then runs down with a buzzing sound, audible to the operator at central by the microphonic action thereby caused. When the slide is first pushed in, a false slug or token, if of iron or steel, will be picked up by the permanent magnet *m*. When the coin finally gets past gate *e*, it lodges on a bolt *h*, sliding in bearings 70, and this exposes the coin or token thru a glass pane 42. When the machine is again actuated the arm 69, on lever *f*, sweeps over spring dog *o*, and on the return movement pushes back the bolt *h* to drop the coin. The lever *k* has a dash pot to retard its forward return, so as not to allow finger 81 to interfere with the coin permanently.

Digitized by Google

No. 655,809.—A. STROMBERG AND A. CARLSON. SIGNALING APPARATUS AND CIRCUIT THEREFOR.

This is a spring contact for generators. Spring *l* rests on contact *m* normally, but when the handle is turned the collar or flange *h'* thereon lifts spring *l* and breaks it away from *m*. The shaft passes thru a hole in the spring *l*, which clears the shaft until the handle turns. The normal circuit is thru contact *m l* to the ringer, and when handle is turned it is thru *h' l* from armature windings to ringer, thus cutting in the generator.




655,810. TELEPHONE EXCHANGE SYSTEM.

No. 655,810.—A. STROMBERG AND A. CARLSON. TELEPHONE EXCHANGE SYSTEM.

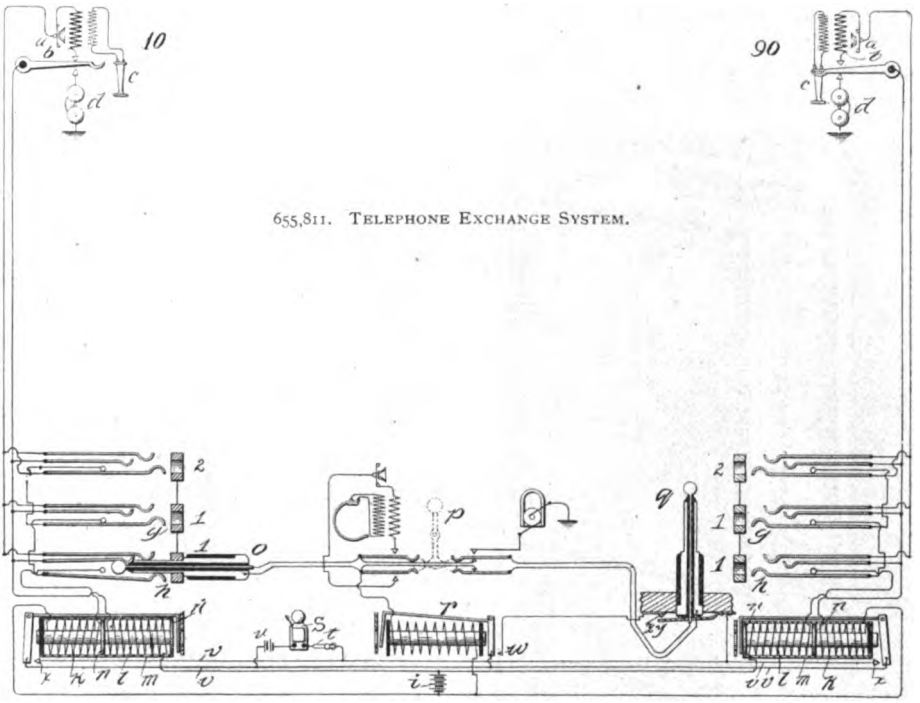
This is a multiple-board system, wherein a common source of current at the central office supplies subscribers' transmitters and all signals. Each line annunciator has two windings, *k*, *l*—the first to magnetize the core and work the signal shutter, and the second a balancing winding enclosed between iron heads *n-n*. Each energizing winding *k* is connected to line thru series connections in all the multiple jacks, while the balancing coils *l* are connected to line thru the answering jack only. When a pair of plugs and their cord are used to connect the answering jack *h* of a calling line, to the multiple jack *e*, *f* or *g* of the wanted line, the result is to leave the energizing coil of the first or calling annunciator connected between one side of its line and battery, and the balancing coil of the called line connected from the other side thereof to the opposite side of battery, whereby the battery is bridged thru a line and a balancing coil, and the annunciator of the calling line serves as a clearing-out signal.

No. 655,811.—A. STROMBERG AND W. M. DAVIS. TELEPHONE EXCHANGE SYSTEM.

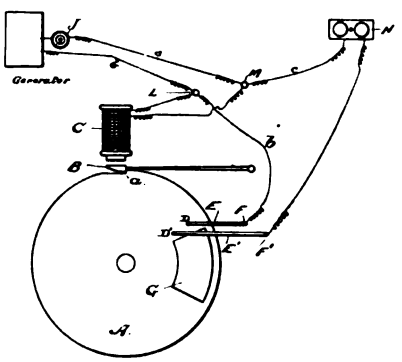
This is a system somewhat similar to the above, having centralized battery, with energizing and balancing windings on each line signal magnet, and a clearing-out signal magnet *r* connected permanently from one side of the cord circuit to battery. The main point in this case is the inclusion of a circuit-closer in the calling plug-seat of each pair of cords, this circuit-closer having

Digitized by Google

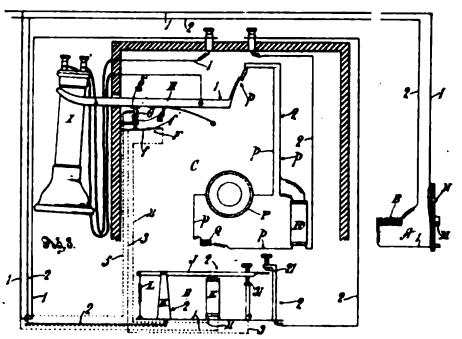
its contacts included serially in the circuit of the night alarm branch to the clearing-out relay *r* referred to. This is necessitated by the construction of the clearing-out signal. It is energized to retire its signal during connection, and deënergized to show its signal when the subscribers hang up. There is no particular objection to this target being shown during disuse of the cord, but there is decided objection to having the night bell continuously ringing; so the calling plug opens the night-bell branch when restored to its seat, by separating spring *y* from point *z*.




655,811. TELEPHONE EXCHANGE SYSTEM.



655,849. TELEPHONE BELL CUT-OUT.



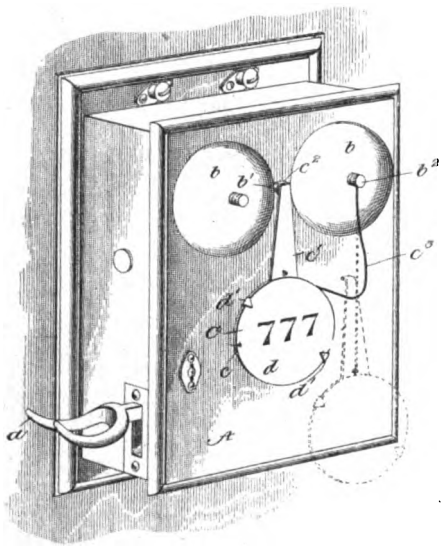
655,916. SYSTEM FOR INDIVIDUAL SERVICE ON PARTY LINES.

No. 655,849.—L. F. COBB. TELEPHONE BELL CUT-OUT.

This is a time-selective device for party lines of the type that preceded the Carty bridging bell. A clock mechanism is located at each station on the line, and all the clocks run in unison. Each clock turns a disk of rubber A, with a section of metal G, the sections of metal

Digitized by Google

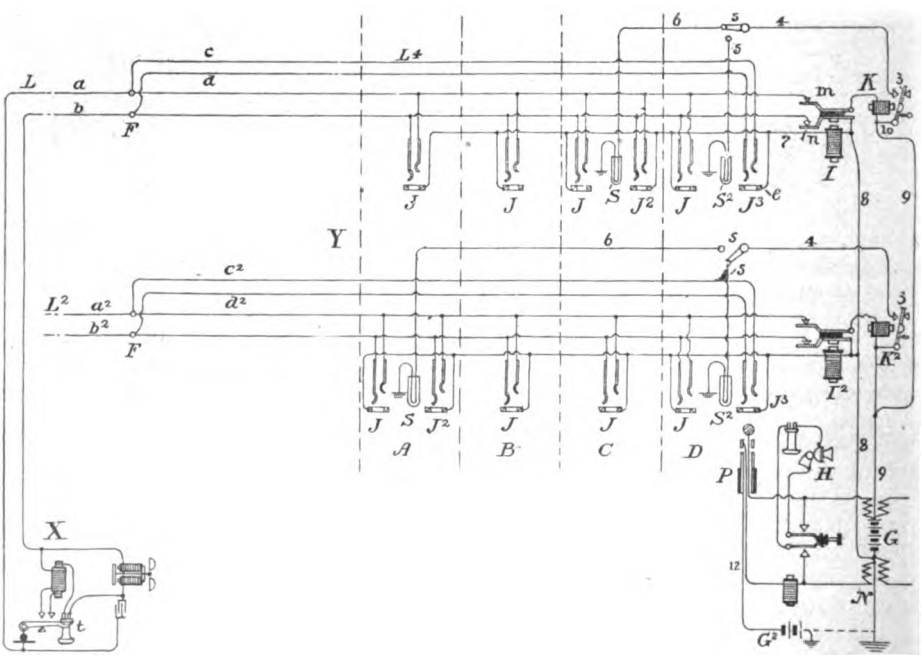
being located successively in advance of each other around the disks, at the successive stations. The sender, desiring to call station 2, sends an impulse thru the line and all magnets C respond by starting their disks. The sender waits until just the proper time has elapsed for the bell contacts E E′ at station 2 to come on the metal section, and then rings. If he desires station 3, he waits a little longer, and so on, his own station dial serving to show him how the other dials are turning.




655,992. INDICATING DEVICE FOR RECEIVER.

No. 655,916.—W. TORST, JR. SYSTEM FOR INDIVIDUAL SERVICE ON ELECTRICAL PARTY LINES.

This is a lock-out party-line scheme. At each station is a relay D, with its magnet E bridged by the hook H when it rises, and its contacts 21-31 forming terminals of the local telephone circuit, to be closed by deënergization of the relay before conversation can be carried on. When the receiver is first removed from the hook H the springs G *f′ f* are together for a moment, and the central office signal at A is set by current from battery B. At the same time current passes to magnet E, which pulls down armature J and cuts out the talking apparatus. If the operator at central wishes the station to talk, she presses a button N, which breaks the line circuit for an instant, thereby deënergizing the magnet E, and permitting the retraction



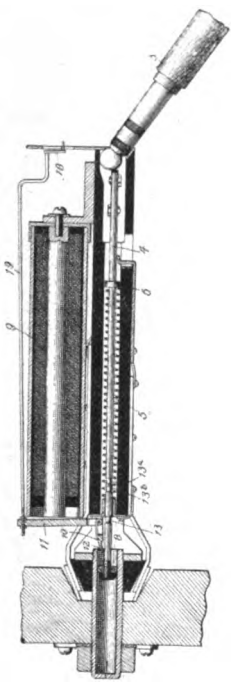

656,333. TELEPHONE SWITCHBOARD APPARATUS.

Digitized by Google

of armature J to recomplete the circuits for talk. If any other parties attempt to come in on the line during its use, their relays D will all work as described, and they will be held out except by permission of the operator.

No. 655,992.—W. R. Rathvon. Indicating Device for Telephone Receivers.

This is a tag fastened to a gong by a string and hung on the clapper by the



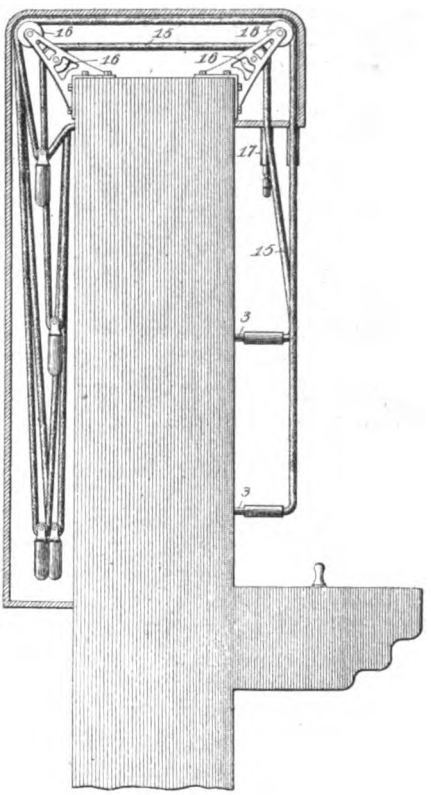
653,336. Switchboard for Telephones.

finger $c'$, so that it will fall off when a signal comes in, thereby indicating a call during absence of subscriber.

*August 21.*

No. 656,333.—T. C. Wales, Jr.

This is a multiple switchboard system based on the same principle as one of those patented April 3, 1899, to the Sun Electric Manufacturing Company, known as the relief-board system. It contemplates a normal connection for a subscriber's line to an answering jack and signal at some one section of the switchboard, but parallel or branch connections to a relief section, with a switch to control the latter. During the busy part of the day each line so provided is switched onto the relief board, and calls are answered there, the connections being restored to normal when the rush is over. In the diagram S is a lamp signal and $J^2$ an answering jack at one section of a switchboard, while $S^2$ and $J^3$ are corresponding parts at another section. By




656,384. Switchboard for Telephones.

means of a switch $s$ the line may be thrown to either section.

No. 656,336.—M. I. Baird. Switchboard for Telephones.

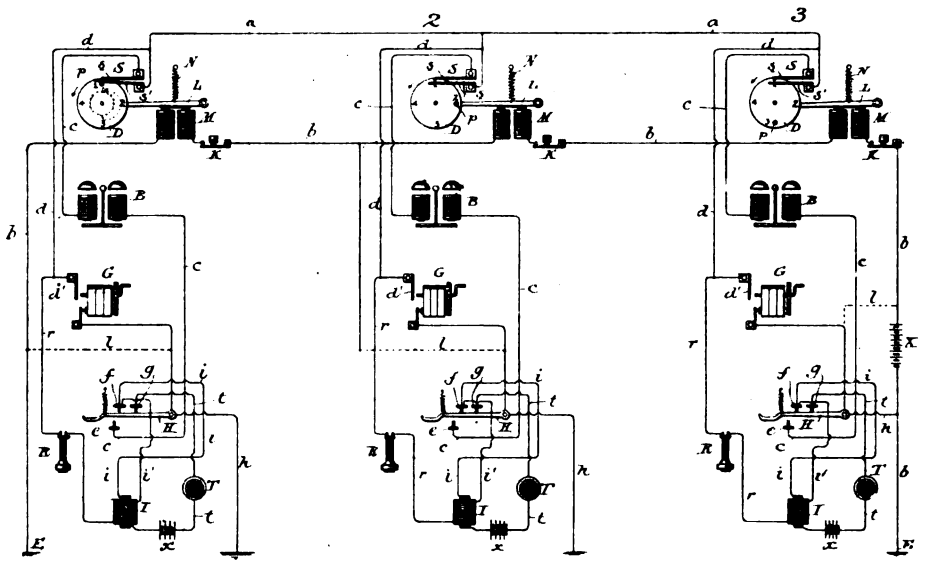
This case covers mostly structural features of drop and jack. The line terminal as a unit is held on the back board by hollow bolt 7 and suitable nuts. It consists of a magnet 9, armature 11, signal disk 18, jack 5-6, and various springs in the latter connected to generator and line $i$ $k$. In the jack tube is a plunger 4, having a dash pot at its rear end formed in the bolt 7, and this regulated plunger forces out the plug at the

Digitized by Google

termination of a conversation. The plug then hangs as shown, to attract the operator's attention. When the answering plug is inserted to answer a call, the plunger is only depressed far enough to latch, as this plug is short, but the calling plug is longer, and when inserted to its full length its sleeves pass onto generator springs not shown in the figure, and remain thereon as the plug is slowly moved by the plunger until pawl 12 takes in tooth 13*a* or 13*b*.

set and the first to the ringer when completed, but normally interrupted at springs *s-s* of a switch S. The switches S are all controlled by dials D having pins *p* on their faces to engage the springs *s s'*, and the rotation of the dials is controlled by escapement mechanisms worked by magnets M, in a series signaling circuit *b*.

If the first station desires to ring the third he works his key *k* until his dial (and therefore all the dials) has been



656,703. TELEPHONE SYSTEM.

No. 656,384.—M. I. BAIRD. SWITCHBOARD FOR TELEPHONES.

This is the generic case, the one just referred to being specific. In the present case a line unit with plug ejector is used, the dash pot also being employed, and, in addition, the plugs are arranged to be drawn up out of the way of the operator, when they are ejected. The manner in which this is accomplished is shown in the figure.

*August 28.*

No. 656,703.—F. G. RUGH. TELEPHONE SYSTEM.

This is a selective party-line system. It consists essentially of a main-talking circuit, 2, with branches *c* and *d* entering each station, the second to the talking

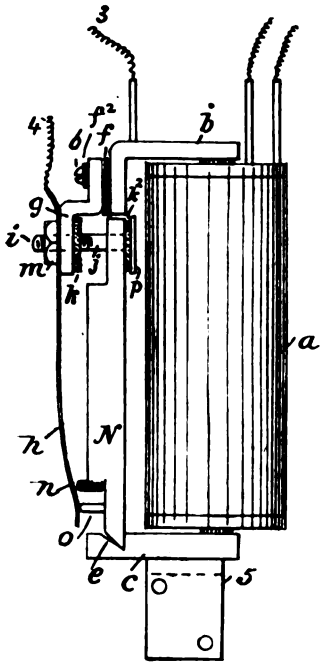
stepped around to bring the Fig. 3 upward. At the third station this will bring pin *p* under the springs *s-s'* and close the ringing circuit *c*. No. 1 can then use his generator G to ring No. 3's bell B, but he will not ring any other bell, as all the other ringer circuits are open at their springs; their pins each requiring a distinctive number of steps to close the local spring contacts.

No. 656,796.—G. K. THOMPSON AND E. C. ROBES.

This is a sluggish relay of unique design, *a* is a coil, the pole pieces of which are *c* and *b*—the former straight and having a notch *e* to receive the foot of armature N; and the latter bent outward and downward at the side of the

Digitized by Google

coil to overlay the upper end of the armature. *g* is an insulated elbow carried on the pole piece *b*, and itself carries

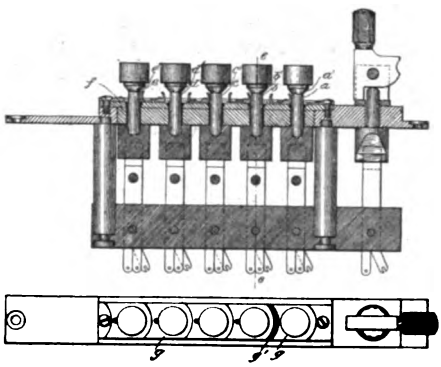



656,796. SIGNAL RECEIVING RELAY.

the insulated limiting stop *j*, with heat *p*. *k* and $k^2$ are insulating disks, *h* is a local circuit terminal spring, and *n-o* are two projections on the foot of the armature, the former insulation, the latter metal. The pressure of spring *h* on one or other of the points *n-o* is quite heavy and almost balances the retractile effect of the armature's weight.

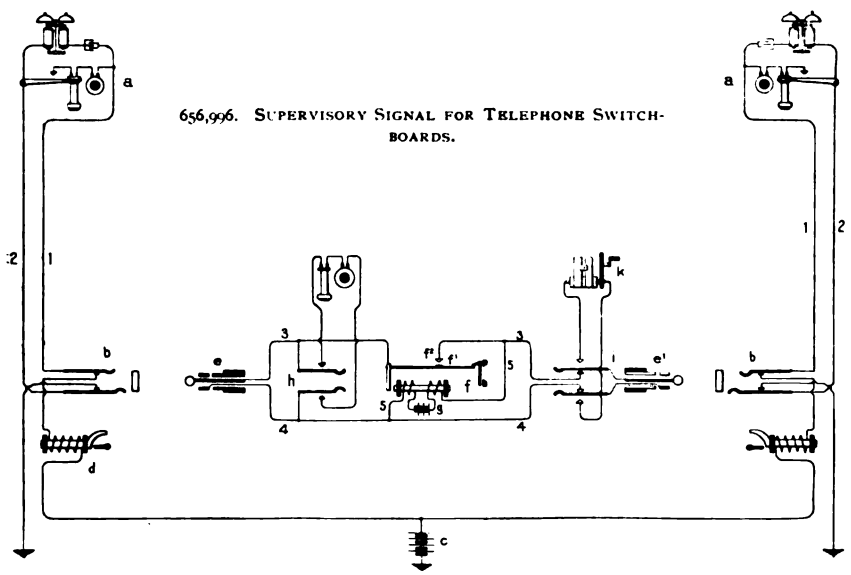
NO. 656,907.— J. STEINER AND W. H. TUCK. TELEPHONE SIGNALING APPLIANCE FOR PARTY TELEPHONE LINES.

This is a very simple and effective means for indicating which of a set of



656,907. SIGNALING APPLIANCE FOR PARTY LINES.

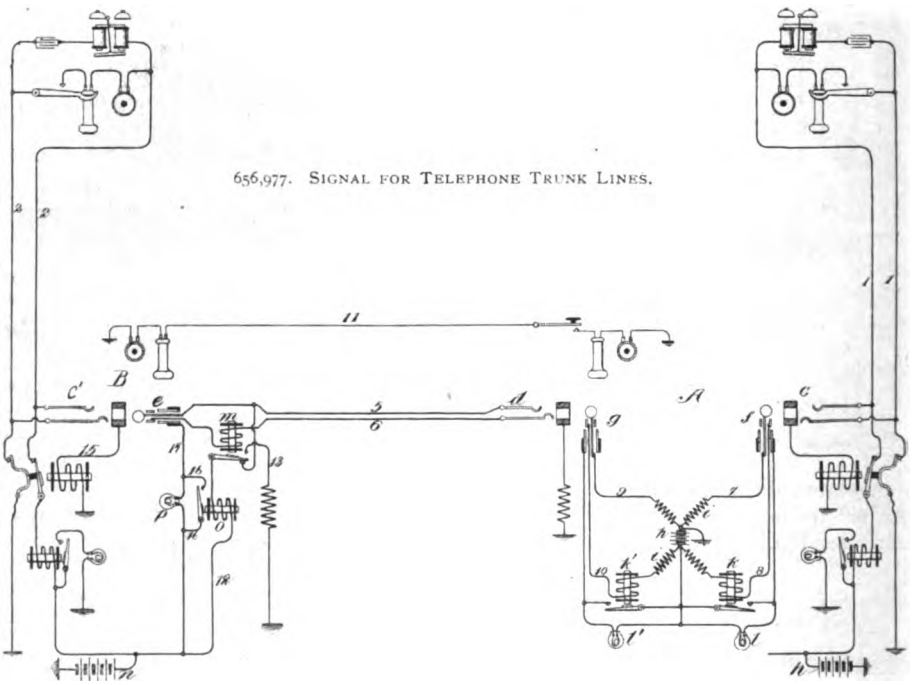
selective ringing buttons was last used. Along the top of the panel carrying the buttons are a series of little scales or movable slips thru which the stems of the buttons pass. Each slip has an




656,996. SUPERVISORY SIGNAL FOR TELEPHONE SWITCHBOARDS.

Digitized by Google

uncolored and a colored portion, and an upturned pair of fingers resting beside adjacent buttons ; and each slip overlaps the next one to cover its colored portion. The proportions are such that the united length of the uncolored and exposed parts of all is almost but not quite sufficient to reach the length of the row of buttons. A very narrow strip $g^1$, of color is always exposed ; and this is always around the last button pushed, as that button will have pushed the fingers of the adjacent plates apart to uncover this joint, and by the same motion will have pushed all other joints together.



656,977. SIGNAL FOR TELEPHONE TRUNK LINES.

### No. 656,996.—F. R. McBERTY. SUPERVISORY SIGNAL FOR TELEPHONE SWITCHBOARDS.

This is a supervisory signal for centralized battery systems, consisting of a signal and relay $g$ bridged across the answering end of the cord 3-4 — one side of the cord being interrupted at $f^1$ $f^2$ until the relay is energized.

As the cord is interrupted the closure of the line 1.2 at subscriber's calling station $a$ can not give passage to current from battery $g$, but as soon as called subscriber $a$ on the right answers and thereby closes his circuit, current from the battery flows to line, magnet $g$ is energized, and contacts $f^1$ $f^2$ are brought together to complete the cord. The retirement of the target $f$ indicates to the operator that the wanted subscriber has answered.

In clearing out, after the circuit is once closed at $f^1$ $f^2$, it is necessary for both subscribers to hang up and break their circuits before the relay is deënergized and its signal displayed.

### No. 656,997.—F. R. McBERTY. SIGNAL FOR TELEPHONE TRUNK LINES.

This is a trunk clearing-out signal. At central office A are shown the usual circuits of the centralized battery "relay" switchboard, with bridged battery grounded on one side at $h$. When a call is trunked over trunk line 5-6 a circuit is formed from $h$ to and thru conductor 5 to the back contact and armature of relay $m$, relay $o$, wire 12, battery $n$ and ground. Relay $o$ closes shunt about lamp $p$, whose circuit is

Digitized by Google

traced from battery *n* to wire 14, jack sleeve, wire 15, and cut-off relay to earth. When the called subscriber on line 2-2 answers, relay *m* gets current from battery *h* over lines 5-6 and subscriber's line 2-2. This relay *m* then pulls up its armature and closes circuit of relay *o* thru local wire 13 to ground, thereby clearing the thru line of external disturbing branches. When operator at A removes plug *g* from trunk jack, relay *o* gets current no longer, the shunt 16 is broken, and lamp *p* shines out as a clearing-out signal to operator B.

## REMOVAL NOTICE.

The American Battery Compound Company, of Chicago, Illinois, manufacturer of American Battery Compound, a battery salt of superior quality to replace sal ammoniac in all zinc-carbon cells, has removed its office and factory from 31-33 South Canal street to more commodious quarters at 224-226 South Clinton street. This step was made necessary by the rapid growth of the firm's business, which was wholly beyond its expectations. The new factory has a capacity of 15,000 packages of compound per day, and the company is now in a position to fill all orders promptly, and would like to correspond with supply houses, telephone exchanges and others now buying sal ammoniac.

## TRADE NOTES.

THE new telephone catalog, No. 15, just issued by the Electric Appliance Company, is most complete and up to date. It should be in the hands of every user of telephones and telephone supplies.

FARR CATALOG No. 14 of this well-known wholesale telephone supply house has just been issued, and in addition to the usual line of telephone apparatus, material and supplies, contains a series of high-grade engravings with descriptive matter of the new line of telephones. The list comprises the regular exchange instruments, private line and factory 'phones, bridging and long toll lines, and also the No. 16 desk 'phone for exchange use. A full line of receivers, transmitters, distributing boards and construction material adds to the many interesting features of the book.

"YOU NEEDN'T WORRY," is the title of a neat circular on heat coils and protectors sent out by the American Electric Telephone Company, which contains a good deal of valuable information and advice about burn-outs.

CENTRAL ELECTRIC COMPANY, appreciating the steadily increasing demand for a line of paper telephone cables and conductors, conforming to the latest engineering practice, has just secured the sales agency for the products of the National Conduit and Cable Company, New York, which is today equipped with one of the largest plants in the United States, both in conduit and cable departments for manufacturing and installing all kinds of regular and special work, comprising principally paper insulated wires and cables for power, railway, telegraph and telephone distribution.

THE Western Electrical Supply Company, of St. Louis, has completed arrangements with the Western Telephone Construction Company, of Chicago, for exclusive territory on its complete telephone equipment and is now prepared to supply all classes of telephone apparatus, adapted to all purposes, including not only complete central office telephone equipments, but also strictly high-grade magneto call or centralized battery systems, and special toll-line equipment adapted to any special work.

The Western Electrical Supply Company claims that by combining its present large facilities on all general construction material, of which it carries one of the largest stocks in the West, with such well and favorably known apparatus as the Western Telephone Construction Company makes, it has a most excellent combination.

A large and well-assorted stock of Western Telephone apparatus is carried in St. Louis, so as to care for emergency orders with promptness and dispatch.

" . . . In fact, every number is a mine of information for the practical telephonist." HARRY S. KRUM.

Digitized by Google

## Wanted.

POSITION by experienced young man, able to take care of exchange. Familiar with every detail of work, including toll and trunk lines. Address,

C. C.
TELEPHONE MAGAZINE,
Chicago, Ill.

POSITION as manager and electrician for exchange of from 200 to 300 subscribers. Experience in construction, operation and maintenance. Best references. Address

O. M.,
Care TELEPHONE MAGAZINE.

POSITION, by a No. 1 all-round man, as superintendent or manager of a telephone exchange. Up-to-date and thoroly posted in all branches of the business. Married; strictly temperate, and a hustler. Eleven years' experience. Very best of references. Address,

H,
TELEPHONE MAGAZINE,
Chicago, Ill.

**Charles A. Brown & Cragg,**

**ATTORNEYS AT LAW and SOLICITORS of PATENTS,**

**1450 Monadnock Block, CHICAGO.**

EDWARD E. CLEMENT. WM. D. GHARKY.

**CLEMENT & GHARKY**

**Patents and Patent Law**

**GENERAL ELECTRICAL EXPERTS**

**SEARCHES, REPORTS, OPINIONS**

Stephen Girard Building, PHILADELPHIA.
McGill Building, WASHINGTON, D. C.


# Telephone Magazine

## CONTENTS OF THIS NUMBER.


Telephone Switchboards. By H. P. Clausen. (Continued) ..... 89
Talks and Cross-talks. By A. E. Dobbs ..... 95
The Chicago Express Board ..... 101
The H.-C. Bi-Polar Receiver ..... 102
Some New Exchanges ..... 102
Editorial ..... 104
American Street Railway Association ..... 105
American Electric Fuse Company ..... 105
The Kellogg Catalogs ..... 105
American Battery Compound ..... 106
Development of the Telephone. By Ed L. Barber .. 107
About Western Apparatus ..... 108
Recent Publications ..... 109
Independent Items ..... 111
Digest of Telephone and Kindred Patents. By Edward E. Clement ..... 113
Removal Notice ..... 123
Trade Notes ..... 123



You can't "See that hump" on McRoy conduits.

JOHN T. McROY
302 BROADWAY, NEW YORK
138 WASHINGTON ST., CHICAGO


Digitized by Google

# Telephone Magazine

Copyright, 1900, by Electrical Engineering Pub. Co. Entered at the Chicago Postoffice as mail matter of the Second Class.

VOL. XVI. CHICAGO, OCTOBER, 1900. NO. 109

## TELEPHONE SWITCHBOARDS.

BY H. P. CLAUSEN.

(*Continued.*)

Since the publication of the first section of these articles, the writer has received several communications criticizing the stand he takes in reference to the selection of a switchboard.

Exception is taken to the passages in which a full central energy exchange system is said to possess no great advantages over an exchange system in which the signaling only is a centralized battery type. Another point to which exception is taken is the passage in which it is suggested that a multiple switchboard is not a desirable equipment for exchanges giving service to less than five hundred subscribers.

As regards the question of the suitability of the multiple switchboard for exchanges which never are expected to grow over 500-lines capacity, let us consider the advantages and disadvantages of a multiple switchboard as compared to the ordinary divided exchange type. In selecting a switchboard for a 500-line exchange, the first question which comes up is the matter of all of the operators being enabled to reach or connect with any particular subscriber on the switchboard.

In the multiple board where all of the subscribers' lines are equipped with switching appliances distributed and so disposed that any one operator can reach any desired subscriber's switching jack, the question of reaching the subscribers' lines is quickly disposed of. In this respect the multiple board of course possesses an advantage not had in the divided exchange type. Now then, as to the disadvantages of this form of construction, it must be remembered that inasmuch as a given operator may connect with a subscriber's line whose signal is located before another operator, some means must be provided for preventing the displaying of the called-for subscriber's line signal while the calling operator projects a signaling current over the circuit. The prevention for producing this false signal lies of course in the construction of a self-restoring line signal or in the provision of a multiplicity of jack circuits or the provision of a series of contacts thruout the series of multiple jacks connected to the subscriber's line. All of these features possess inherent disadvantages, and not one of these disadvantages is possessed by the divided board exchange systems. Of course when a divided board is used, it becomes necessary to provide a system of trunk circuits by which a connection may be extended from one switchboard to another. The means employed for extending the connections are generally of an exceedingly simple nature, and may be justly compared to the multiple jacks and self-restoring arrangement in the multiple switchboard, and if the advocate of a multiple switchboard for small exchange use will only give this matter careful consideration, the writer believes that no further exceptions will be taken to his stand taken in the matter.

As regards the advantages and disadvantages possessed by the full central energy and centralized call switchboards, the writer suggests that the full central energy enthusiast permit himself to depart from his fixed ideas long enough to examine the operation of an exchange system equipped with centralized calling

Digitized by Google

apparatus, that is, a system in which the signals are transmitted automatically from a source of current obtained from an equipment of batteries placed at the exchange and where the subscribers' instruments are supplied by current obtained from batteries placed at the subscriber's station. After making an examination as to the efficiency of operation as viewed by the telephone-user, let him learn what expense is had at the exchange for supplying current to the subscribers' circuits and also let him learn what the maintenance of the battery equipments at the subscribers' stations costs, and compare the costs with the operating expenses of a full central energy system. If the enthusiast is fair, the writer believes that he will obtain a great deal of valuable information and also gain a better opinion of the centralized call system, and last but not least, he will find that the subscribers of the centralized call system are getting a surprisingly better service than the subscribers of a full central energy system ever did.

One point in regard to the matter of expense occasioned in maintaining the batteries at subscriber's station is the use of dry cells. The writer knows of several exchanges in which two dry batteries are placed into each telephone equipment. These cells cost the exchange manager about 14 cents, this price depending somewhat on the quantity purchased at one time or contracted for at one time for delivery. Now then, the managers of these exchanges give definite instructions to their inspectors that whenever a battery falls below a certain strength to remove the battery from the equipment and install a new cell having the proper strength. In this way the batteries in a subscriber's equipment are always kept to a uniform strength. On first thought a rigid observance of this order might be regarded as eventually resulting in the accumulation of a large number of dry cells and an increase in the expense of maintenance. Not so, however, for it has been the experience of each one of the managers of the above exchanges that they are unable to meet the demands made by bell hangers and other users of dry batteries for cells partially exhausted; such batteries, while they may have been rejected by the telephone company, still have enough energy to give service where the current is used intermittently and not for an extended length of time as would be the case in telephone service. It is hardly necessary to state that the dry cells rejected by the manager of a telephone exchange will probably give excellent service in door bell or annunciator work for at least one or two years; and that the batteries which are rejected by a telephone manager are sold by him at an advance of ten or fifteen per cent over the original cost of the cell. This is not theory but actual practice, as is shown in centralized call telephone exchanges where the subscribers' stations are equipped with dry batteries judiciously selected, that there is practically no item of expense for maintenance of subscriber's station batteries. This being a fact, easily determined, the question of expense between operating a centralized call and a full central energy system can not be used as an argument in favor of the full central energy system.

As regards the matter of signaling, the two systems are precisely alike, with the advantages in favor of the centralized call board, particularly in reference to the current consumption, because in most forms of full central energy boards there is a waste of current during the time of conversation; for, as a rule, the supervisory lamps are shunted out of circuit, the current being maintained, however, thru a resistance across the lamp, this resistance being cut out and the lamp allowed to burn when a subscriber signals for disconnection. Thus the full central energy system may be regarded as possessing a marked disadvantage over the centralized call board as regards the consumption of current, and, necessarily, expense in operation.

As the matter of toll-line service in connection with switchboards has already been discussed, it will not be necessary to go into details, further than to say that a full central energy system can not be made to give as good service over a given toll-line circuit as the service which can be given by a centralized call system. This is another question of prac-

Digitized by Google

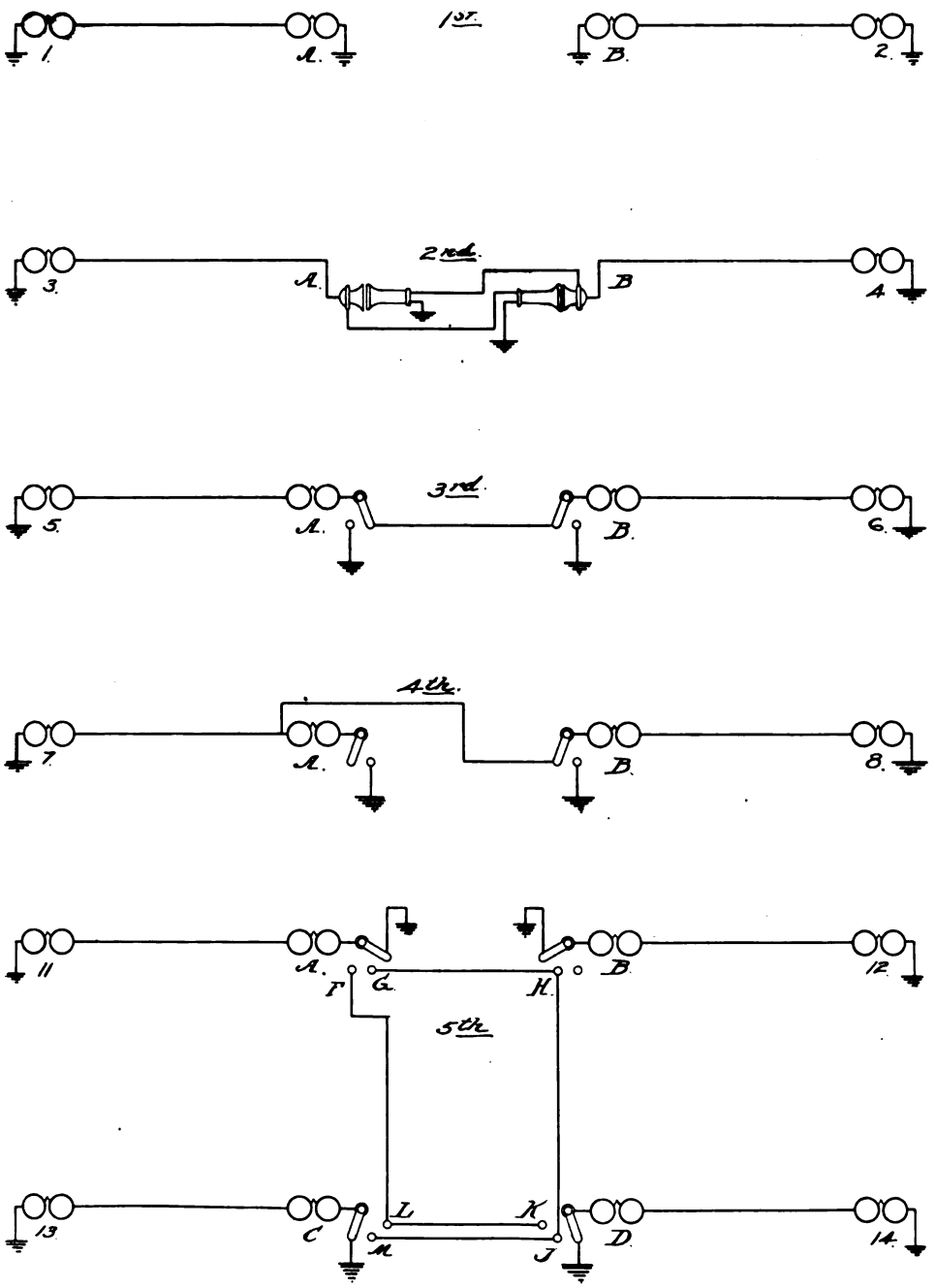



FIG. 1.

Digitized by Google

tice and not theory, and the writer invites a full discussion on this point if any full central energy enthusiast feels disposed to intelligently discuss the matter in detail and not by making broad and indefinite statements. For the benefit of the unbiased reader, the writer suggests that future articles will describe systems designed for use in connection with centralized call apparatus as well as the full central energy systems, and that the reader will then be better able to judge which possesses the greater merit, both as regards the operation and simplicity of the design of apparatus and system of circuits.

Proceeding now with the subject of this article, let us refer to the accompanying diagrams and discuss the fundamental means which may be used for connecting together subscribers' lines terminating at a common station. The writer claims nothing new for any of the circuits shown, but believes that the reader will obtain a better idea of switchboard circuits and their design by referring to the diagrams.

Fig. 1 shows five series of circuits. If a telephone user desires to speak to another telephone user, some means must be provided for permitting communication between 1 and 2 stations. One method, and a very common one, would be for an operator at the A station to receive the message from station No. 1 and repeat it to station No. 2. Another method which may be employed to very great advantage is shown in the first diagram, where telephone No. 3 is placed into communication with telephone No. 4 by a very efficient form of telephone repeater. On first thought this system of interconnecting two circuits might appear complicated, but when it is remembered that two telephones setting alongside of each other may be used by simply removing both receivers from the switchhook and placing the B receiver before the A transmitter and the A receiver before the B transmitter, the operation becomes a very simple one. Of course, the method shown by the interconnection of the 5 and 6 telephones would be much more simply and easily applied; but with two telephones belonging to different and perhaps antagonistic companies, the switching appliances can not be applied without risking discovery, whereas the placing of the respective receivers before the telephone transmitters precludes all chances of discovery. The one disadvantage possessed by the circuits connecting the 5 and 6 telephones is that both telephone bells are necessarily left in the talking circuit, which of course results in a reduction of the transmission. In order to prevent this, to a certain extent, at least, one of the bells may be cut out of circuit, as is shown by the fourth diagram in which the 7 and 8 telephones are connected together and in which the A telephone is cut out of circuit, the B switch having a point connecting to the line side of the bell, and when the B and A switches are thrown to the left the A bell will be open and the No. 7 circuit connected to the No. 8 circuit thru the B switch and bell.

With two telephones terminating at a point, no great difficulty is experienced in providing some means for connecting them together, but when more than two circuits terminate at a given point and it is required to connect them together in every possible combination, the problem becomes more difficult. Referring to the fifth diagram, telephones 11, 12, 13 and 14 are shown connected to switches to A, B, C and D, these switches normally resting upon a ground connection. In addition to the ground contact the A switch is provided with a contact G, extending to contact H, J and M, and another contact F extending to L and K. Thus the B switch is provided with the H contact and the D switch with K and J and the C switch with L and M. In order to connect together the 11 and 12 lines, the A switch is placed upon the G contact and the B switch upon the H contact. In this way the two lines are connected together, the same system of connecting being followed when telephones 13 and 14, or 13 and 12, or 11 and 12, are required to be connected together. This method of operating switchboards, while it answers very well for small exchanges, is not at all suitable for larger equipments.

In the earlier form of switchboards, a system similar to that shown by Fig. 2

Digitized by Google

was used. In this form of a switchboard the telephones numbering from 1 to 6 inclusive are connected together by

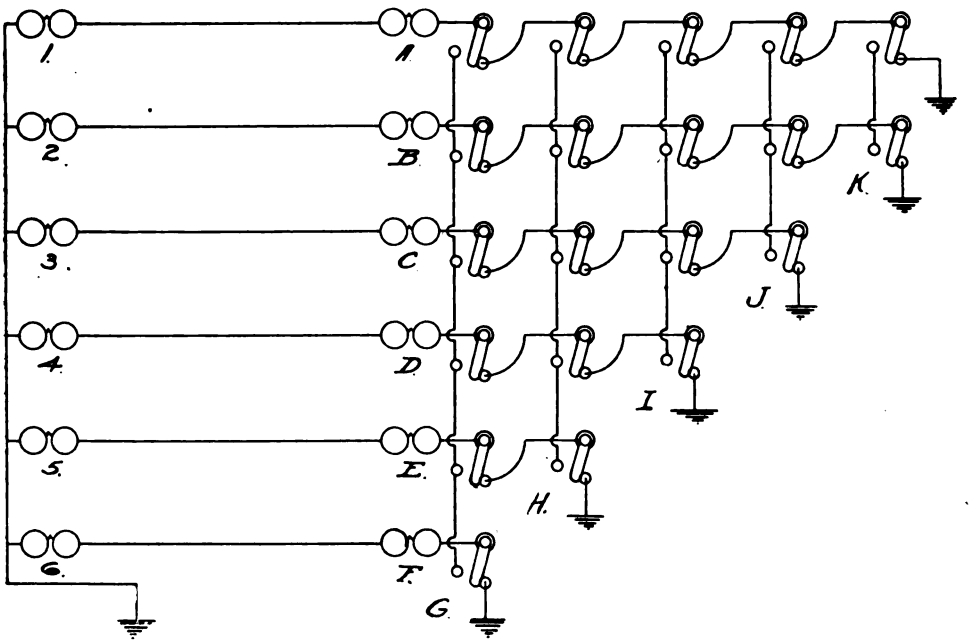



FIG. 2.

means similar, in a general way, to that shown by the fifth diagram in Fig. 1. Inasmuch, however, as it is desirable to reduce the number of contact points as much as possible, No. 1 line is shown equipped with five switches, No. 2 line with five switches, No. 3 line four switches, No. 4 line three switches, No. 5 line two switches and line No. 6 one switch. Now then, if it is required to connect together the Nos. 1 and 2 circuits the A and B switches are thrown together by means of the contacts K, and if the 1 and 3 circuits are required to be connected together the J contacts are used. In operating a switchboard of this construction, care should be exercised to use the proper vertical row of contacts. Thus, for example, if in connecting the A and B circuits the G contacts had been used, it would have been impossible to reach the F circuit from C, D or E. In other words, when we economize in the number of switch points and switches, a certain definite method of operating must be followed.

Referring to Fig. 3, it will be observed that telephones Nos. 1 to 20 inclusive are shown connected together by means of variously constructed switching appliances and systems of interconnecting. While the diagrams show the circuits arranged on the single wire or common-return system, it is obviously possible to adapt any of them to a double wire or metallic-circuit system, the single wire plan being shown for the purpose of permitting a more ready understanding of the problem of interconnecting telephone circuits. In the first diagram, the telephones No. 1 and No. 2 are terminated at A and B in signal receivers connecting to the jacks J and J′ which in turn normally rest in contact with the ground point. A connection between the 1 and 2 stations may be established by placing the P and P′ plugs into the jacks J and J′. These plugs, upon being inserted into the jacks, lift the springs away from the ground contact and thus leave the 1 and 2 telephones connected

Digitized by Google

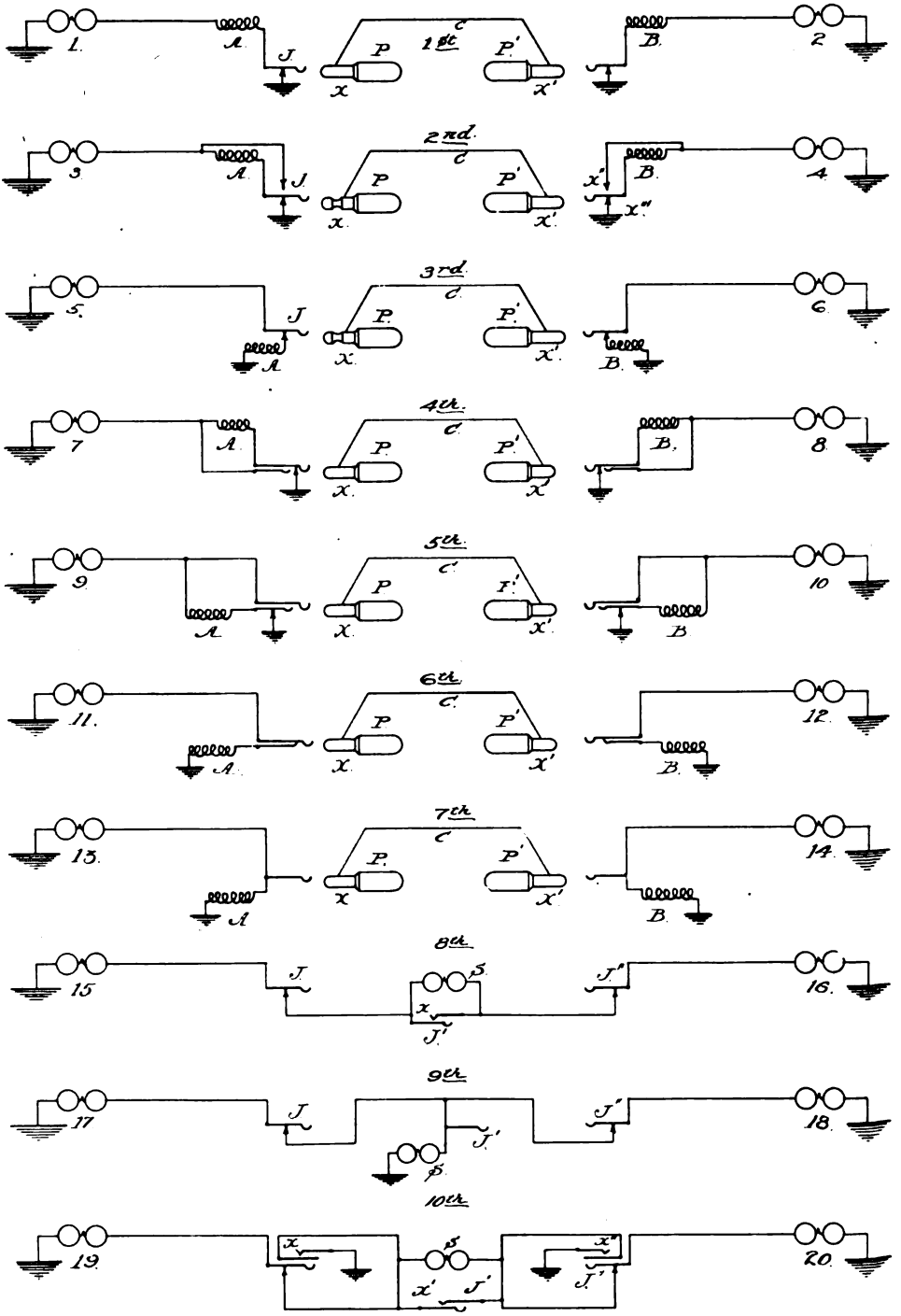



FIG. 3.

Digitized by Google

together thru the A and B signal receivers and cord C. With this connection it would, of course, be necessary for the telephone current to pass thru both the A and B drop. This, as was described before, is undesirable. Therefore the second diagram shows a system by which the 3 and 4 telephones are connected together by means of the specially constructed jacks J and plugs P. The construction of the jacks, it will be observed, is such that when the P′ plug is inserted into the J′ jack that the J spring makes contact with the X′′ point and at the same time loses contact with X′′′ joint. Thus it will be observed that the B drop is cut clear from the earth and at the same time shunted out of circuit, and, therefore, removed from the talking circuit. Now then, if both plugs had been constructed alike it would be necessary to insert some signaling device which would permit of the 3 and 4 telephones signaling the switching station. In the second diagram, however, no auxiliary signaling device is provided, as the P plug has a recess at X into which the spring J lies in such a manner that it neither touches the ground or shunting contact. In other words, the A signal receiver is left in a series circuit, and therefore serves as a clearing signal.

In a great many instances it is objectionable to have a clearing signal connected in series with a talking circuit, and in order to meet the demands for a more suitable construction, the third diagram, which shows the telephones 5 and 6 connected together by an interconnecting system constructed similar to the second diagram, but instead of providing the jack with a shunting contact the signal receiver is placed between the jack-spring contact and the ground. With this construction, the P′ plug would, of course, cut the jack clear from the drop contact, but the P plug being provided with the recess X would leave the signal A in bridge with the interconnected telephones. With the above construction, it is, of course, necessary that the signal receivers possess high retardation, particularly to the talking currents, as otherwise an unsatisfactory service might be had between the stations connected. In the fourth diagram a form of construction is shown which is widely applied in actual practice. The system is a modification of the second shown; but it might be stated that this modified construction possesses several advantages over the former.

Referring to the diagram, it will be observed that each jack is equipped with two springs and that the upper spring rests in contact with a ground connection, the lower spring being connected to the line side of the signal receiver. Upon examining the diagram it will be observed that the X portion of the P plug is somewhat longer than the X′ portion of the P′ plug. Now then, when the 7 and 8 telephones are required to be connected together the P plug upon being inserted into the J jack causes the upper spring to clear the ground contact and the lower spring to press up against the upper spring which results in shunting out the A drop. The P′ plug, however, by virtue of its shorter X′ tip only reaches into the jack far enough to make contact with the upper spring and causes the latter to break contact with the ground spring; but in view of the fact that the X′ portion of the plug does not reach the lower spring, the drop B is left in circuit as a clearing signal. The same objections might be made to the presence of the series-connected clearing-out drop as was made in referring to the second diagram. Therefore the fifth diagram was prepared and shows a method of connecting the 9 and 10 telephones in such a way that one of the signal receivers is left in multiple with the telephone circuit. Briefly, the upper spring connects to the line wire and the lower spring to the signal drop. At the same time it rests upon the ground connection. Now then, if the X′ plug be placed into the jack it will, of course, result in no change as regards the connection of the drop, but if the X plug had been used it would, of course, have resulted in lifting the lower spring clear from the ground and at the same time shunting out of the signal receiver.

Another method of connection is shown by the sixth diagram in which a system similar to that shown by the fifth

Digitized by Google

is used, the only difference between the two systems lying in the fact that the line drop does not connect permanently with the line wire and that the lower spring takes the place of the ground contact shown in the previous diagram. In operation the two systems are similar, the P plug making contact with both of the springs and thus leaving the drop in circuit while the P′ plug does not reach far enough into the jack for making contact with the lower spring. In the seventh diagram a very simple system of connection is shown. As it will be observed, the line drops are connected directly to the line wires and ground, while the spring jacks merely form branch circuits from the line side of the drop. With this construction the signal receivers of both lines are left in circuit. This may not be regarded as the best form of construction, but it possesses the merit of being simple and not easily becoming inoperative thru poor contact or crosses.

The eighth diagram shows a method of connecting together two telephones, 15 and 16, in such a manner that either one of the above stations might signal the other and obtain immediate attention from the called station without any act on the part of an intermediate operator at the switchboard. As it will be observed, the 15 telephone connects to the jack J and thru the back contact to the J′ spring jack and from the latter thru the signal receiver S, back contact of J″, thence thru the jack spring to the telephone 16. In case the operator of the switchboard decides to learn whether the normally interconnected circuit is being used she would place her listening plug into the J′ jack, this act resulting in the shunting out of the S signal by reason of the jack J′ making contact with X. This listening-in operation being performed of course without any interruption to a conversation which might be passing over the circuit. If the operator received a request for connection with either of the telephones she would first have listened in at J′ jack, and if the circuit was clear she would have placed her calling plug into, say, the J jack and thus cut the No. 16 telephone clear from the No. 15 circuit and permitted of signaling or otherwise communicating with the station No. 15 to the exclusion of the remaining circuit. The above circuit, while it gives excellent satisfaction where a limited number are used, possesses an objectionable feature, namely, when a plug is placed into the J jack the No. 16 telephone has no means left for calling the operator's attention, as the circuit would be open at the lower contact of jack J. In order to obviate this objectionable feature the ninth diagram was prepared, showing the 17 and 18 telephones connected together in a similar manner to that shown in the previous diagram. The signal S, however, is wound for a much greater resistance and higher retardation, which becomes necessary on account of its being connected in a branch circuit to ground, the jack J′ being shown connected to the line side of the signal S.

The tenth diagram the writer believes will meet the demand for an intermediate station switch connecting together series-connected telephones. As was explained, the eighth diagram showed a method for connecting together series telephones, but the system was faulty owing to the fact that the signal S was left open when either the J or J″ jacks received a connecting plug. In the tenth diagram it will be observed that while the connections in general remain the same as shown by the eighth and ninth the J and J″ jacks are provided with an auxiliary upper spring and contacts X and X″. With this construction the placing of a plug into the J jack would result in forcing the upper spring into contact with the X point, and as it is clearly shown by the diagram grounding of the A side of the S signal receiver. This grounding of the signal receiver would permit of the No. 20 telephone for operating it ; and vice versa, if a plug were placed into the J″ the No. 19 telephone would be enabled to signal the operator.

In reviewing the diagram shown by Fig. 3, it might be stated that the first, second, third, seventh and eighth systems are little used by manufacturers of telephone switchboards, these systems often being met with in the older forms and somewhat antiquated types of switchboards. The systems shown by the

Digitized by Google

fourth and fifth diagrams are being used exclusively for both series and bridging toll-line works by mostly all of the manufacturers. The system shown by the sixth diagram, while it is entirely practicable, has had to give place to the more desirable equipment shown by the plan immediately preceding it. As regards the ninth and tenth systems, the writer believes that they are becoming better known and are being more widely applied than any system of intermediate station switches yet designed or placed upon the market.

*(To be continued.)*

## MORE CHICAGO TELEPHONE COMPETITION.

A rival of the Chicago Telephone Company and probable rate wars are possibilities if passage should be accorded the ordinance introduced into the council granting the United Telegraph, Telephone & Electric Company the right to extend its territory so as to make it coextensive with the city limits. The corporation, which formerly was the Hyde Park District Telephone & Electric Company, now has a service with more than four hundred subscribers in Hyde Park and its vicinity. According to its president, W. T. Block, it has a capital of more than $1,000,000 and a plant worth nearly $200,000.

The purpose, it is explained, is to increase the capitalization, establish lines in the heart of the city, Englewood, South Chicago and other suburbs in which the Chicago Telephone Company now operates and compete with the latter organization. In a communication addressed to the city the company agrees, if the ordinance (which went to the Committee on Gas, Oil and Electric Lights) is passed, to complete the down-town service for 2,000 subscribers in five years. If it fails to do so it will forfeit the lines now owned and turn over the work as far as completed.

President Block asserts that if his company is given the right to erect a system it can furnish a telephone service at cheaper rates than can be had at present. The company pufposes to charge for residence telephones $50 a year; for business telephones, $85 a year; and for public instruments, $125. It asks for a twenty-five year franchise and agrees to pay to the city three per cent of the gross receipts the first five years, five per cent for the next ten years, and seven per cent for the remaining ten.

The Chicago Telephone Company charges $60 for residence telephones and $125 for those used by business houses. The public instruments are operated by the slot-machine system and are placed in many places gratis.

---

DUNKIRK, N. Y. — The Dunkirk Home Telephone Company, of Dunkirk, has been incorporated to operate in the city of Dunkirk and the towns and villages of Chautauqua county. Capital stock, $100,000. Directors: Albert R. Smith, Tonawanda; George H. Frost, Buffalo; Addison E. Lord, Samuel B. Rawson, Irving H. Griswold, James A. Drake, Frederick H. Sudro and Clayton Chapman, Elyria, Ohio.

---

## FROM BOSTON.

Couch & Seeley Company, of Boston, send in a well-gotten-up catalog, and in their announcement give expression to their appreciation of the Independent Telephone business with which they have been favored. One statement made in the announcement, that they do not need to expatiate upon the merits of their own equipment nor to detract from whatever is meritorious in that of their competitors, is not only good Christianity but good advertising. The cuts are large and show much of the detail in the construction of the various devices manufactured by them which, with the brief and clear description given, make the catalog a desirable one. Regarding patents they have this to say: "We believe it safer to avoid infringement by investigating in advance and allowing to others the justly deserved benefits of their discoveries. To this end we employ the best expert advice in all possible complications, and have at our command the best legal ability in telephone and switchboard patent matters. We shall continue to stand back of our products in all questions of infringement as in the past, and any one can readily ascertain whether we are financially able to do so."

Digitized by Google

# TALKS AND CROSS-TALKS.

BY A. E. DOBBS.

## HINTS TO CORRESPONDENTS.

Write on one side of the paper only, and make sketch or diagram, when necessary. Endeavor to give all the facts bearing on the case, so as to enable the editor to answer intelligently.

Name and address must accompany each letter, not for publication, but for the information of the publisher.

### A UNIQUE TRANSPOSITION.

58. I have two metallic lines arranged and transposed as in Fig. 1.

I have a great deal of cross-talk and would like to know how to get rid of it. The short line (No. 1) is five miles, and the longer one (No. 2), ten miles in length.

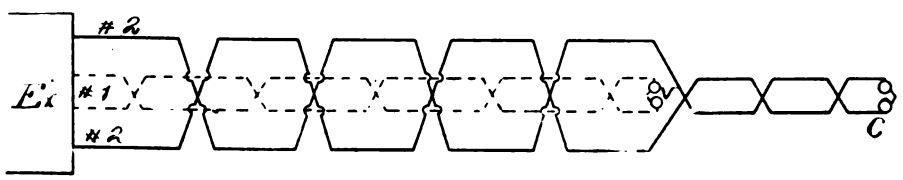



FIG. 1.

Well, we should think you would have cross-talk! Had you connected the lines by means of a repeating coil you could not have obtained much more. Change your wiring so that the two circuits run side by side and it would also be a good idea while doing this to transpose the short one twice as often as the longer one.

### CENTRAL BATTERY SYSTEMS.

There have been a number of inquiries on central battery systems, and in order to answer them all the Inspector will review the whole subject in a general way and to those who wish to study the subject further he would refer them to "American Telephone Practice," by Kempster B. Miller, which can be procured by sending $3 to the editor of this paper.

By studying the back numbers of THE TELEPHONE MAGAZINE a large number of the latest devices and systems offered by both the Bell and Independent inventors can also be found.

By central battery systems are meant those in which all signaling is automatic, so that by taking the receiver from the hook or pushing a button the operator is called, and hanging up the receiver is also equivalent to a "ring off." In some cases all batteries, both those used for calling and also to actuate the transmitter, are placed in the central office. In others, the signaling is done automatically, while the transmitter is worked by means of the usual local batteries and induction coil.

The first are called "full central energy" and the latter "automatic signaling" or "supervisory" systems.

In the first class, the appliances have as yet hardly become perfected enough for very long-distance work, tho long steps have been taken in that direction within the last year and nearly all of them of recent date give splendid local service, and it is probable that they may soon give as good service in toll-line work as the local battery instrument. Some even now do good work up to a distance of 400 miles over good lines.

With instruments of the second class we have all the advantages of the first in the way of full supervision and also the long-distance talking qualities of the local battery instrument.

Central battery systems of all kinds

Digitized by Google

require good construction and good insulation of all lines, as otherwise, with the current from the batteries continually present in the lines and cables, serious faults may be developed.

Poor cables and slipshod construction may answer, and even give a very fair service with the ordinary magneto system but *not* with the other. Perhaps on the whole this is a good thing, as poor work don't pay anyhow.

There is a difference of opinion among telephone men as to the battery pressure to be used in these systems: Some manufacturers are trying to keep the battery pressure as low as possible and I know of one exchange working successfully on a pressure of 12 volts, and I recently tested a board that would give clear sharp signals at this pressure over seven miles of No. 14 steel wire. There are others, however, who boldly make use of a battery of 50 volts, the danger of which may be minimized, however, by the use of first-class and carefully handled cables and even then some good engineers doubt the advisability of such pressures. This, however, is a problem that will work itself out in a short time.

In spite of its disadvantages the great popularity of cheap telephones, which in some towns equals one instrument to every tenth person, makes a system that can give quick service necessary, and the fact that a central battery system enables one operator to do the work of two under the old system is an attractive idea to stockholders in those companies, to say nothing of the subscriber who has nothing to do in order to call "central" but take his receiver from the hook and no "ring off" except to hang up again.

In Fig. 2 is shown a full central battery system which looks complicated, but which a little study will enable any one who knows anything about telephone circuits to understand. Let us begin at the subscriber's instrument at A. Here we have a ringer wound to 1,000 ohms or more, often from 3,000 to 5,000 ohms, a transmitter and receiver. When the hook is down the bells are in circuit and the talking apparatus out and vice versa.

At the switchboard end of this line we have a battery sending current thru the drop D, the jack J, and the line and bells. Now this would actuate the drop D, but for the fact that the resistance of the ringer magnets at A are of such high resistance, that not enough current can pass to do so. A cross in the line, however, would throw the drop and it would stay thrown till the trouble was cleared.

When, however, the subscriber takes his receiver from the hook the resistance of the line is lowered and then the drop D moves. In some cases the shutter falls forward, as in the ordinary magneto

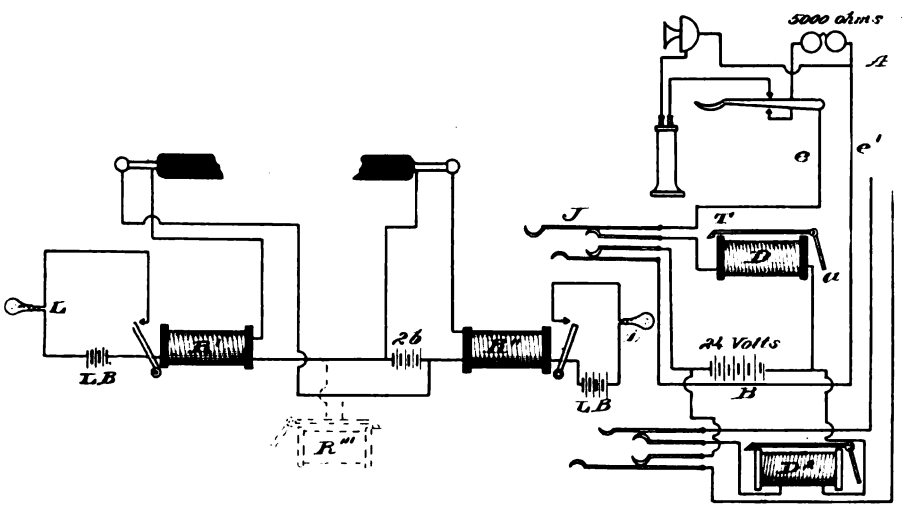



FIG. 2.

Digitized by Google

boards. In others, as the one shown in the sketch, the shutter tag is down behind a screen till the armature moves, when it comes up into view of the operator and remains there till she plugs in, thus breaking this circuit, when it falls back again by its own weight.

For the sake of simplicity the operator's listening and ringing set is not shown here, but it does not differ much from that of any other system.

When the operator plugs in, it will now be seen that both the battery, B, and the drop are completely cut out of circuit and another battery, *2b*, comes in thru the cord, which also feeds both cords, the line to which the second cord is connected being like the first.

Our student has perhaps noticed two relays, R′ R″, in this cord circuit and perhaps also noticed two lamps, L L′. Of course he can see that when the magnets come forward the lamps L L′ will also be lighted by means of the local batteries L B. The explanation is simple. Current from the battery *2b* passes thru the cords, over the line, thru the receiver and transmitter and back again, holding the magnets forward as long as the receiver is off the hook. When the receiver is hung up the high resistance of the ringers shuts off the current, the armature flies back and the lamp goes out. In some cases a magnet and shutter is used instead of a lamp. In others the circuit is so arranged that the lamps go out when both subscribers are on the line and light up again when they hang up.

In some cases only one drop or one lamp is used in a cord circuit, owing to the fact that the Bell company have some patents on that double lamp arrangement pretty hard to evade, tho some manufacturers think they have succeeded in doing so.

It has also been asked: "Why does not this battery (*2b*), common to all the cord circuits, mix things up and produce cross-talk?" For the reason that the battery is of very low internal resistance and therefore each cord circuit gets the same amount of current. Then too, the relays R′ R″ act as choke coils, and while they pass the current out to the line they will not pass the rapid undulations of the transmitter circuit back to the batteries, so that they, therefore, act only on the receivers in the line.

There are two objections to this system, one being that the current continually present in the cables has a dampening effect on the conversation and another being the amount of current consumed.

Supposing that our ringers are wound to a resistance of 5,000 ohms and the pressure of battery B = 25 volts, then one line would take $\frac{25}{5,000} = .005$ amperes. This is not very much, but 100 such lines would take $100 \times .005 = .5$ ampere while 1,000 lines would continually consume $.005 \times 1,000 = 5$ amperes, which would soon pull down even the 400-ampere-hour cells.

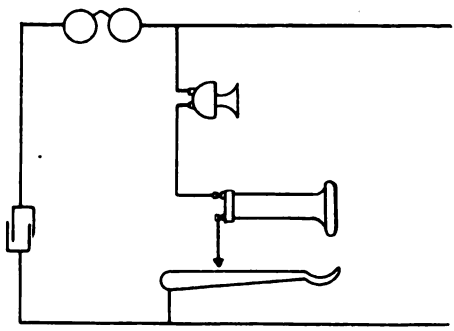


FIG. 3.

In order to prevent this waste the subscriber's instrument is sometimes arranged as in Fig. 3, in which a condenser is inserted in the ringer circuit, which leaves it open except to the rapidly alternating currents of the office generator, the line being short-circuited by the receiver and transmitter as in the other case.

In Fig. 2 is shown the use of choke coils by means of the relays R′ R″, but a better method is shown in Fig. 4 in

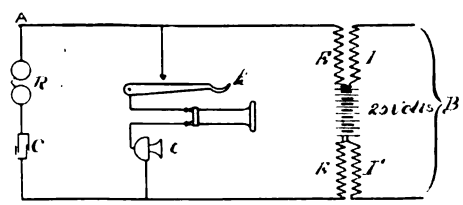



FIG. 4.

Digitized by Google

which the coils I I′ are simply a special form of induction coil; the two end windings are attached to the battery. In this case we can conceive the current moving out from the battery thru both coils *e e* to the subscriber's instrument at A, and also energizing the instrument at B, which is of the same design. Now, by studying this circuit, we see that variations in the transmitter at A will introduce undulations into the entire left side of the circuit or the A line and also the *e e* side of the coils. It also stands to reason that these undulations will be taken up and repeated in the right-hand or B side of the coil and sent out over the B line. Thus when A is talking and B listening the coils *e e* act as primary and the other side as secondary windings of an induction coil. With B talking and A listening the reverse takes place and the windings *e e* become secondary. This may seem strange owing to the fact that a continuous battery current is continually flowing over one side or the other of these circuits, but this is explained by the fact that two or more currents can easily "ride" on one wire, if such an expression may be used.

In some cases it is thought desirable to take the receiver out of this primary circuit, as even a low resistance receiver acts as a choke coil and interferes to a certain extent with free undulations of the battery current.

One of these circuits used by the Bell Company is shown in Fig. 5, in which the battery current comes thru a primary coil to the transmitter while the receiver is in the secondary.

Fig. 6 shows a form used by one of the independent manufacturers, in which the battery is fed to the line thru two choke coils *c c* which allow a steady flow of battery to the line but which do not

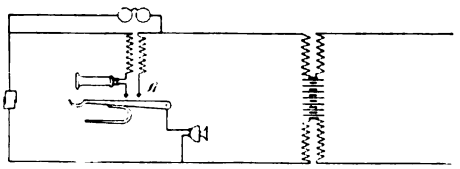


FIG. 5.

readily allow the voice currents to pass back to the battery.

The induction coils at A and B have a primary winding said to be of less than 1 ohm and a secondary of 75 ohms.

59. Will you tell me how to make a spark coil for gas engine work, giving size of wire, number of turns, size of core, etc.? Which is better — a long or a short coil?

J. F. G.

This query does not belong strictly to these columns, but as nearly all exchange managers are now riding around in auto carriages they will no doubt be interested in the subject.

In regard to the size of these coils much depends on the kind of battery used, but as a general thing some sort of a closed circuit cell giving a large current output is best. Such are the Edison, Laland, Gordon, or Nungresser, and for cells of this class the tendency among manufacturers is to use a shorter and thicker core and larger number of turns than formerly. The claim made is that a short coil gives a somewhat quicker action than a long one and is therefore more reliable, while the increased number of turns of wire increases the resistance, thus decreasing the amount of current used and giving longer life to the battery; while a comparatively small, intense spark is just as efficient as a larger but colder one.

The following data taken from coils

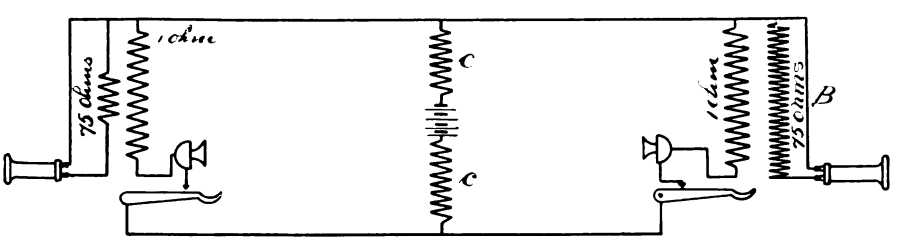



FIG. 6.

Digitized by Google

regularly sold on the market will give an idea of the sizes in general use :

No. 1.

Length over all, 6 inches.
Diameter of core, 1 inch.
Size of wire in core, No. 20 soft Swedish iron.
Number of turns on core, 500.
Size of wire used, No. 16 B. & S.
Current required, 1.5 to 2 amperes.
Resistance, 1.25 ohms.
Single cotton-covered insulation.
After being made up the coil is boiled in paraffin till every particle of moisture is expelled.

No. 2.

Length 10 inches.
Size of core, 1⅛ inches.
Size of wire, No. 16 B. & S.
Resistance, .6 of an ohm, wound to a depth of 6 layers.

No. 3.

Same, except that the length is 8 inches instead of 10 inches.

Nos. 4 and 5 were given me by a bright young friend, who has experimented considerably with gas engines and spark coils.

No. 4.

Length, 8 inches.
Core, ⅞ inch.
Size of wire in core, No. 18.
Size of wire used, No. 16 B. & S., wound to a depth of 8 to 10 layers.

No. 5.

Length of core, 16 inches.
Size of core, 1⅛ inches.
Size of wire used, No. 12, wound two layers deep.

All of the above, with the exception of No. 5, require from five to six cells to do their work properly, while No. 5 requires more.

## WIRELESS TELEGRAPHY.

A cable dispatch of October 6 from England states that Marconi transmitted a message successfully a distance of sixty miles by means of his wireless system of telegraphy. The transmitting end was stationed at Boulogne, France, the receiving end at Dover Court. This was accomplished without the use of the elevated tower or pole and the message was received on a cylinder four feet in height. This shows a wonderful development of the system since the first tests were made, and indicates the almost limitless application of the wireless telegraphy of the future.

As an indication of the practical use of the system the Wireless Telegraph & Signal Company, Limited, of England, has obtained a grant from the Chilian government to establish the Marconi system and transmit messages between Punta Arenas and Ancud, the government granting the right to use the public lands. There are also reports from Washington, D. C., that the navy department has reopened negotiations with Mr. Marconi for applying his system to the vessels of the United States Navy. After the demonstration of his system as applied to naval use Mr. Marconi asked $10,000 for each set of instruments installed and $10,000 royalty, which the department regarded as an excessive price, and the adoption of the system was deferred indefinitely. Since that time the British admiralty has contracted for thirty-two sets of instruments and installed them on board their warships at a cost of $1,000 each. At this price the Washington authorities seem willing to trade, and it looks as if the system will soon be in use by our government.

## NEW EXCHANGES.

SOUTH WHITLEY, IND.— The South Whitley Telephone Company has been incorporated, with a capital stock of $3,000.

SUSQUEHANNA DEPOT, PA. — The Susquehanna Telephone & Telegraph Company has been granted a charter. The capital stock is $5,000.

OAK HARBOR, OHIO.— The Ottawa County Telephone Company has been incorporated to build telephone lines. The incorporators are H. Metzger, E. D. Harkness, T. Fuller and others.

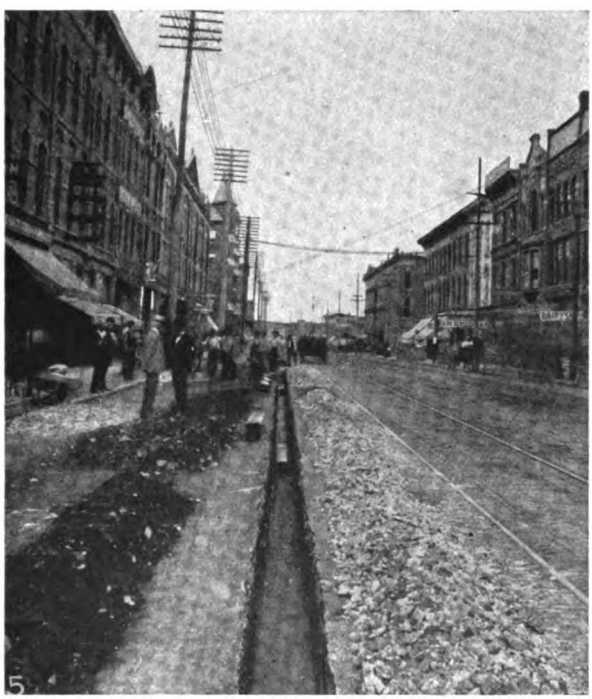
SIOUX RAPIDS, IOWA.— The Sioux Rapids Telephone Company has been organized to operate and maintain a local telephone line at this place. The incorporators are P. J. Cilley, R. H. Hulett, W. B. Mills and others.

Digitized by Google

### THE TERRE HAUTE EXCHANGE.

While the Citizens' Telephone Company actively is a new enterprise for Terre Haute, the organization itself is by no means in its infancy. The company is now, as it has always been, owned and controlled entirely by Terre Haute capital.

In April, 1886, the Citizens' Telephone Company was incorporated by Andrew J. Crawford, Andrew Grimes and Joseph H. Briggs. At that time A. J. Crawford was president, and Andrew Grimes, secretary, the capital stock of the company being $25,000. It was the intent and purpose of these gentlemen to build and operate a telephone exchange in the city of Terre Haute in competition with the Central Union Telephone Company. The Citizens' Telephone Company was one of the first in the United States, and probably the first in the State of Indiana, to organize for the purpose of competing with the so-called Bell monopoly. The gentlemen who at first conceived the idea of this organization endeavored to carry their plans to a conclusion, but it was prior to the expiration of certain patents owned by the Bell Telephone Company, which patents practically controlled the operation of a telephone plant. These gentlemen made several attempts to purchase and install apparatus that would not infringe the patents referred to above, but in each instance found it impossible to do so. While they had a franchise from the city, under which the company still operates, and while they had the best wishes of the people of Terre Haute, they were obliged to let the matter rest in statu quo. Interest was never lacking in the enterprise, and the company was only awaiting the time when it would be able to take up the matter of its original purpose vigorously.



LAYING CONDUIT.

Accordingly, in May, 1898, thru the suggestion and efforts of Charles R. Duffin and A. M. Higgins, of this city, the old matters of the Citizens' Telephone Company were again taken up, an understanding having been arrived at between these gentlemen and the owners of the

Digitized by Google

Citizens' Telephone Company, by virtue of which the control of the company passed into the hands of Messrs. Higgins and Duffin. In May of that year Mr. Higgins was made president of the company, Messrs. Crawford and Grimes having resigned from their respective positions, and Charles R. Duffin was made secretary.

At that time Messrs. A. L. Millard, W. P. Ijams, Col. John Beggs and H. W. Beggs came into the company. They practically reorganized it and joining there with the Home Telephone Company of Clinton, giving service to its patrons to some three hundred points outside of the city of Terre Haute by connecting with various other independent lines.

A great many propositions were made by a number of different gentlemen to construct the Citizens' Telephone Company's exchange at this point. Nothing definite was ever done in this connection, however, owing probably to the fact that all of the gentlemen mentioned

CONDUIT MANHOLE.

adopted new by-laws. Later on in the same year the officers and directory of the company were as follows: W. P. Ijams, president; C. R. Duffin, vice-president; A. M. Higgins, secretary, H. W. Beggs, treasurer; John Beggs and A. L. Millard, directors. The officers and directory of the company remained as just stated until March, 1900. While the company was under the management of this directorate they undertook and built a complete metallic toll line from Terre Haute to Clinton, above were men of many affairs outside of their telephone interests, and there was no one of them who could afford to devote the time necessary to the organization and completion of an exchange of the magnitude and involving the amount of money that an exchange adequate for Terre Haute demanded.

Accordingly, late in the year 1899, Henry A. Coit, of St. Louis, Missouri, who was a practical telephone man, and who had had considerable experience in organizing, building and operating tele-

Digitized by Google

phone exchanges, having been instrumental in equipping some eight or nine plants, came to Terre Haute with a view of taking up the proposition. He devoted his entire attention to this work and in March, 1900, the company was again reorganized, its capital stock being increased to $150,000, and considerable new capital invested in the enterprise, sufficient to guarantee carrying it to its completion. While all those gentlemen who had been stockholders before, with the exception of Messrs. Crawford, Grimes and Briggs, still have their holdings in the company, new stockholders came in and the officers, stockholders and directors of the company were then created, and are today as follows:

President — Fred B. Smith.

Vice-president — Charles R. Duffin.

Secretary and treasurer — G. A. Conzman.

General manager — Henry A. Coit.

Directors — W. P. Ijams, John Beggs, Samuel R. Hamill, J. Keyes, A. Z. Foster, H. G. Miller, H. W. Beggs, A. L. Millard and A. M. Higgins.

The company entered into an arrangement with Mr. Coit to take charge of the work and the company immediately rented offices and began making its plans for the equipment of the plant now under course of construction. George B. Roberts, who was the electrical engineer in the construction of the independent exchange at Indianapolis; who also built the plant at Fort Wayne, Indiana, and who has had various other experience, was employed as electrical engineer to make the plans and specifications, etc., for the proposed exchange. This work was at once taken up vigorously, and from the progress the company has made, it can be seen its efforts have not been without result. It made a canvas of the field for subscribers and found no difficulty whatever in securing a sufficient number to warrant it in going ahead with the work. It has at this time some 750 subscribers, all on three-year contracts.

The Citizens' Telephone Company is the first wire-using company to undertake putting its wires underground in the city of Terre Haute, and with that end in view has laid something over 45,000 feet of underground McRoy multiple duct conduit. This relieves the main streets of Terre Haute of any of the wires of the Citizens' Telephone Company, which fact not only removes from sight the many poles, wires and cables, but is also a great convenience in case of fire, windstorms, etc.; and while it is a most excellent thing for the city, for those reasons, it is also a good thing for the company, from the fact that when the wires are once underground the maintenance is practically nothing for that portion of the construction. The subscriber to the system also gains from this method from the fact that fires and windstorms do not interrupt the service for a moment. The outside construction of the plant is of the very best that can be had, the intent and purpose being to install in Terre Haute an exchange second to none in the United States. As the plant is of recent installation, it gives it the opportunity to take advantage of the latest designed, invented and improved equipment thruout. It is able at this time to install apparatus which is far superior in every respect to apparatus that it could have secured even so short a time as a year ago.

It is installing what is known as a central energy system. Each subscriber has a long-distance telephone, connected direct with the exchange, on complete metallic circuits, it not being the intention of the company to give any party-line service. The switchboard which it is installing is of the very latest design, and is being manufactured, together with the telephones and other central office equipment, by the American Electric Telephone Company, of Chicago, which is the largest manufacturer of telephones and switchboards for sale outright, in the world. This is a central energy board, doing away with all ringing devices at the subscriber's station. All that a subscriber has to do is to remove his receiver from the hook, which signals the central office that he wishes to communicate with it. It is also a multiple board and so arranged that each operator has in front of her a socket for every subscriber in the system, and it is not necessary to transfer a message from one section of the board to the other. In

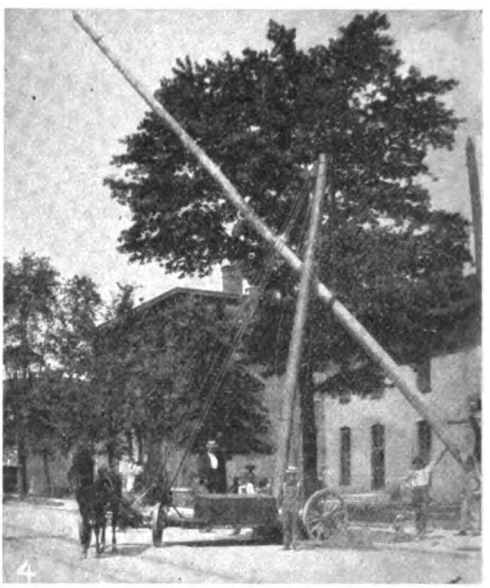
Digitized by Google

other words, any operator has within her reach, without connecting with any other operator, the means of calling any subscriber to the system. It is also provided with what is known as a supervisory signal system, which gives the chief operator and manager complete supervision at all times over each operator. When a subscriber removes his receiver from the hook, a signal is shown on the face of the section of the board to which he is connected. It also lights an electric light — white in color — which indicates that some one wishes to talk. At the same time an electric light is lighted at the desk of the chief operator, he having electric lighting device, ringing and listening keys to correspond with each operator's position. The minute the call is answered the electric light goes out, both at the operator's position and at the supervisory desks. When the subscriber is thru talking a red light shows at both places, which remains lighted until the subscribers are disconnected. This makes it practically impossible for any of the operators to neglect his duty, either in answering calls or disconnecting when thru. The other central office equipment consists of cable racks, cross-connecting boards, lightning protecting devices, power and generating plant, storage battery plant, all of which equipment is to be of the very best obtainable on the market.

A great deal of the materials the company is using in the installation of its plant, including cables, wires, insulators, cross-arms, etc., was purchased from the Rumsey & Sikemeier Company, of St. Louis. The company has adopted a new thing in the way of cross-arms and insulators, it being the first large company to adopt what is known as the American insulator, manufactured by the Wagner Glass Company, of Anderson, Indiana. Instead of using a pin with the insulator screwed on it, as is customary, the insulator goes into the cross-arm parallel to the ground and the wires are strung thru it, making a much neater and at the same time more solid piece of work.

The rates the company propose to charge are $30 per year for business houses and $18 per year for residences, all long-distance instruments, complete metallic circuits and no party-lines. The company has rented the building at 28 South Seventh street, which has been completely remodeled for its purposes. The exchange room and operating room, together with the general plant, will occupy the entire top floor, while downstairs will be arranged a lounging and sitting room for girls, together with lavatories, etc. The front part of the building will be used for the general offices of the company.

The Citizens' Telephone Company has made arrangements with a number



RAISING A POLE.

of outside independent organizations, whereby it will be able to furnish its patrons with superior long-distance service, which will give them direct connection with over 25,000 telephones in the State of Indiana alone. It gives them connection and talking facilities over 7,000 miles of copper metallic circuit. They can talk to any one of the subscribers of the new company at Indianapolis, and a number of intermediate points, and towns of importance thruout Indiana, Illinois and Ohio. All that is required is a connecting link to be built, which is now under course of construction between Greencastle and Terre Haute.

Digitized by Google

The growth of the independent telephone business, not only in the State of Indiana, but in the United States, has been something marvelous, and the Citizens' Telephone Company is not backward, either from its aggressive methods or the character of the service it proposes to render, in bringing Terre Haute to the foremost as an example of what competition in the telephone business is able to accomplish for the business communities in which it operates.—*The Terre Haute Express.*

---

## WIRELESS TELEPHONY.

BY SIR WILLIAM HENRY PREECE, K.C.B.

The first experiments in this direction were made in the month of February, 1894, across Loch Ness, in the Highlands. On that occasion trials were made to determine the laws governing the transmission of Morse signals by my electro-magnetic method of wireless telegraphy, which has formed the subject of frequent reports to this section since 1884. Two parallel wires well earthed were taken, one on each side of the lake, and arrangements were made by means of which the wires could be systematically shortened, with a view of ascertaining the minimum length necessary to record satisfactory signals. It occurred to Mr. Gavey, who was experimenting, to compare telephonic with telegraphic signals, i. e., to ascertain whether articulate speech could be maintained under the same conditions as Morse signaling. The trials showed that it was then possible to exchange speech across the loch at an average distance of 1⅓ miles between the parallel wires, when the length of the wires themselves was reduced to four miles on each side of the water.

What led to this train of thought was the fact that, altho the volume of the telegraphic current was immensely greater than that of a telephonic current, whenever thru want of balance in a loop disturbance was evident, then telephonic cross-talk was also manifest. In other words, a weak telephonic current was apparently as powerful a disturber as a strong telegraphic one.

The sensation created in 1897 by Mr. Marconi's application of Hertzian waves, distracted attention from the more practical, simpler and older method. Mr. Evershed and Prof. Oliver Lodge had in the meantime much advanced the system by introducing admirable call systems.

In 1899 I conducted some careful experiments on the Menai Straits, which determined the fact that the maximum effects are produced when the parallel wires are terminated by earth-plates in the sea itself. It became quite evident that the ordinary inductive effects are much enhanced by conductive effects thru the water, and that in consequence shorter wires are practical. No special apparatus seems necessary. The ordinary telephonic transmitters and receivers were used.

It became desirable to establish communication between the islands or rocks known as the Skerries, and the mainland of Anglesey, and it was determined to do this by means of wireless telephony. The lighthouse at the Skerries was wanted to be in communication with the coast-guard station at Cemlyn, which is connected with the postoffice system. The bottom of the channel is too rough, and the currents too violent for a cable. A wire 750 yards in length was, therefore, erected along the Skerries, and on the mainland one of 3½ miles from a point opposite the Skerries to Cemlyn. Each line terminates by an earth-plate in the sea. The average distance between the parallel portions of the two wires is 2.8 miles. Telephonic communication is readily maintained and the service is a good one. Lodge's call system will be used.

No experiments have yet been made with ships, but it would appear simple to speak by telephone between ship and ship, or between ship and shore, to considerable distances across space by means of a circuit formed of copper wire terminating at each end of the ship in the sea, passing over the topmast and using simple telephones.

---

"YOUR journal is instructive, entertaining and amusing — herewith the almighty — keep her going."

J. C. R.

Digitized by Google

# Telephone Magazine

THE ONLY INDEPENDENT TELEPHONE PAPER IN THE WORLD.

MARQUETTE BUILDING,

TEL. CENTRAL 2541. CHICAGO.

Published on the 15th day of each month.

**Electrical Engineering Publishing Co.**

JOHN C. MCMYNN, PRESIDENT.

**SUBSCRIPTION:**

| | |
|---|---|
| One year, United States and Canada | $1.00 |
| One year, foreign countries | 1.50 |
| Single copies | .10 |



**COPYRIGHT:**

The title and contents of this paper are covered by a general copyright. Permission from publishers must be obtained before any article or table is copied, or any illustration reproduced.


**CHICAGO, OCTOBER 15, 1900.**

WE announce with regret that Mr. C. E. Kammeyer is no longer the editor of THE TELEPHONE MAGAZINE, he having resigned the position he has filled so admirably to connect himself with a well-known electrical publication. To him, in no small measure, is due the success of THE TELEPHONE MAGAZINE, and our good wishes follow him in his new position.

In July, 1898, *Electrical Engineering* was a struggling publication, caught by force of circumstances perhaps, wriggling in one of the then far-reaching tendrils of the Bell octopus. Clearly realizing the future great development of the Independent telephone interests, Mr. Kammeyer at once severed all connection the magazine then had with the Bell company and cast the destiny of the paper for good and all with the Independents.

Starting with the paper discredited by the Independent manufacturers and almost unknown to the rapidly increasing Independent exchanges, Mr. Kammeyer, in the face of difficulties and discouragements, gradually built up the reputation of the magazine until it became under its present title the foremost paper in the Independent telephone field and typical of the growth and development of this great industry.

In doing this he has always commanded the respect of subscribers and advertisers alike, and it is a pleasure for this magazine to acknowledge his successful efforts and to voice the appreciation of his services.

---

THE publication date of THE TELEPHONE MAGAZINE has been, for some time, the 15th of each current month. Sometimes this date was extended as far as the 20th of the month by our former editor when he thought late news or important subject matter of special interest to our readers might justify the extension. This might be the proper thing editorially, but from a business standpoint it looks like a poor proposision. However new or interesting the reading matter might prove to be, its value is likely to be depreciated by the subscriber who receives his September magazine on September 21. For the next two months, THE TELEPHONE MAGAZINE will appear on the 10th of the month, and beginning with the next January number on the 1st of the month. We therefore ask of our contributors that they kindly send in their copy one week in advance of the new date of publication.

---

## FREE TELEPHONES.

In a previous article we referred to the experiment of Augusta, Maine, exchange in offering to likely subscribers the free use of telephones for a few months with the expectation that the users, once educated to the advantages of a telephone system, would prefer paying the regular

Digitized by Google

rental in preference to having their telephone removed. The plan may or may not be a business proposition under ordinary conditions, but it worked successfully in Augusta, and now the New England Telephone Company, spurred on by the invasion of the Independent Telephone Company, offer free residence 'phones on a six-party line service to all business subscribers having 'phones for which they pay, and whose home is near some existing line. No new lines will be built to accommodate free 'phones and the free service expires in four months, when the regular rates will be charged or the telephone removed.

Quite generous.

## AMALGAMATION OF PACIFIC COAST COMPANIES.

The Pacific States Telephone & Telegraph Company has been formed, with a capital stock of $15,000,000, to take in all operating companies in California, Oregon, Washington, Nevada and part of Montana. These in the main consist of the Sunset Telephone & Telegraph Company, the Pacific Telephone & Telegraph Company, the Oregon Telephone & Telegraph Company and the Inland Telephone & Telegraph Company.

John I. Sabin is president of the company, J. C. Ainsworth, vice-president, and Louis Glass, general manager.

In San Francisco alone, the company has over 20,000 subscribers, while in the entire territory the subscribers exceed 80,000 in number, and the business of the company is increasing at the rate of 1,500 subscribers per month.

Quite a big company.

## A STATE ASSOCIATION.

The Mississippi Independent Telephone Association has been organized, to consolidate all of the Independent telephone companies in the State, connect all lines and exchanges and to generally improve the service.

The officers at the head of this laudable enterprise are Hugh Campbell, president; L. B. Camp, vice-president; A. W. Kearley, secretary and treasurer, and C. W. Bolton, assistant secretary.

The amalgamation of a number of exchanges into a unit for the betterment of service is the sunny road to bigger dividends.

## WESTERN BUSINESS.

The Western Telephone Construction Company, of Chicago, has just closed a contract with the Greensboro Telephone Company, of Greensboro, North Carolina, to furnish a complete telephone equipment, consisting of a 1200-capacity central energy switchboard, distributing board and protective devices. The Western is to be congratulated upon receiving the order in view of the fact that the competition was quite spirited among the different manufacturers who submitted bids. A contract to equip Creston (Iowa) Mutual Telephone Company exchange with a Western Express switchboard of 300 lines, and another for a 200-capacity Western Express switchboard for the Sheridan Telephone Company, of Sheridan, Wyoming, has been closed. The same company is also furnishing a 300-line addition to the Gordon Telephone Company, exchange at Charleston, South Carolina, and is putting in a 600-line reëquipment for the Shamokin Valley Telephone Company, exchange at Shamokin, Pennsylvania. The Western has also just completed installing the flash-light transfer system for the Home Telephone Company, at Fort Wayne, Indiana, and in addition it has received a large telephone order from the Southwestern Telephone Company, of New Albany, Mississippi.

## FLIRTING EXPENSIVELY.

The Cumberland Telegraph & Telephone Company controlling the leading lines in the Southern Middle States, requires a bond of $25 from each operator binding them not to use the lines for private conversation — What a soulless corporation! It must be that its management is bald-headed or hoary and has, thru the prosaic habit of counting dividends, become callous to the romance and sentiment which is so deeply instilled in the heart of the telephone girl that it needs must bubble over sometimes — If we lived in the South the girls could come to us for advice, but we hope their Southern gallants will pay their fines.

Digitized by Google

# MONTHLY DIGEST OF TELEPHONE AND KINDRED PATENTS

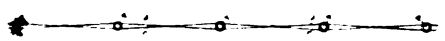
EDITED BY EDWARD E. CLEMENT.

Copies may be had, postage paid, by enclosing 10 cents for each one. Address inquiries in care of this magazine or to McGill building, Washington, D. C.

*September 4, 1900.*

No. 657,104.— L. HACKETHAL. METHOD OF STRINGING OR SUPPORTING ELECTRICAL CONDUCTORS.

This invention relates to the construction and mounting of overhead electrical conductors, the object being to provide a plan for mounting or stringing conductors by which inductional influences are lessened, and a large number of wires may be strung side by side on a pole within a given space at cheaper cost than has been heretofore possible. The

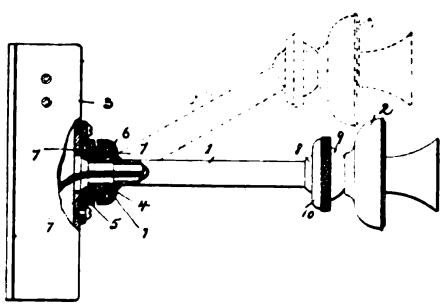


657,104. STRINGING ELECTRICAL CONDUCTORS.

invention contemplates the use of insulated wire, and the support thereof on poles or cross-arms by means of insulators of ordinary character, there being two wires attached to each insulator and upon opposite sides thereof, the wires crossing each other midway between the poles, and, being fastened together, preferably by wrapping with tape at the point of crossing, as shown.

No. 657,288. — G. R. KENNEDY. TELEPHONE TRANSMITTER ARM.

At the present time there is a very perceptible movement among manufac-

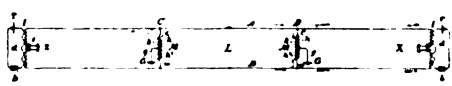


657,288. TRANSMITTER ARM.

turers toward the abandonment of all exposed cords and wiring on telephone instruments except the inevitable receiver cord. The present invention is intended to furnish means for concealing the transmitter wire, and also to provide an efficient supporting arm having motion in various directions. As shown in the figure, the transmitter 2 has a rear hollow base or shell 9, to receive a hollow ball, on the end of the arm 1. A ring 10 is screwed on the shell 9 to clamp the ball. On the coil box or other support 3, a plate 5 is secured, having a hollow base 7, similar to that 9 on the transmitter. Clamping ring 6 fits over ball 4 on the inner end of arm 1, to lock the same. By means of the two ball and socket joints thus formed the arm and the transmitter may be moved to and set at any desired angle.

No. 657,305.— C. H. ARNOLD. MEANS FOR RELIEVING TELEPHONE LINES FROM DELETERIOUS ELECTRICAL CHARGES.

This invention relates to metallic circuit telephone lines, and especially to such as extend between stations a considerable distance apart, and more particularly concerns the application to such



657,305. RELIEVING LINES FROM ELECTRICAL CHARGES.

lines of means for freeing them from intrusive and undesired electrical charges. Telephone lines are liable to receive high potential charges in several ways — for instance, from blowing snow or escaping steam, or, more frequently, since the widespread introduction of lighting and power circuits, from high potential mains employed in other electrical installations. Such charges may fluctuate rapidly and widely in amount and yet at any moment may be of the same sign and of substantially the same amount on both

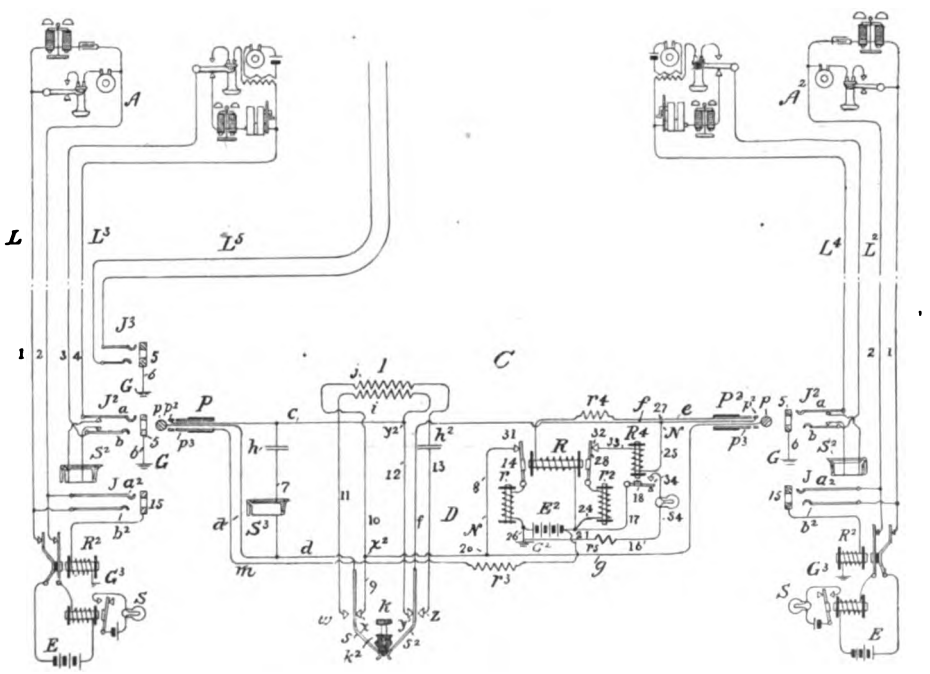
Digitized by Google

conductors of the metallic telephone circuit, and tho they do not in all cases interfere seriously with telephonic communication, they are always in the highest degree undesirable, since by their presence users of the instruments and employes are exposed to unpleasant and possibly dangerous shocks, while their discharge, if unprovided for, is likely to be detrimental to apparatus such as "space cut-outs" and protective devices, which are injured by incessant sparking. The invention consists in grounding the line at various points. In order that both conductors may be discharged at the same points and no short-circuit occur, an impedance coil M is bridged, with its middle point grounded.

No. 657,315.—D. S. HULFISH. TELEPHONE SWITCHING APPARATUS.

This invention relates to the central office connective apparatus, the cords, signals, etc., to be used in exchanges where lines of diverse character are to be handled on the same board and preferably with the same cords and plugs. The tendency toward centralizing all current supply, both for signaling and for talking, which has become widespread and has exceeded the capacity of the manufacturing establishments in its demands, has resulted, for many exchanges, in compromise installations. That is, portions of the exchange equipment will be of the new common battery type, while other older portions are of the so-called magneto type. In this case it is necessary to provide means for connecting common battery lines with each other or with magneto lines, and the latter with each other, all connecting means being uniform in handling, and the different types of signals employed being capable of independent and perfect action under all conditions.

According to the present invention connecting cords are provided wherein normally the terminal plugs are directly connected thru conductors *c*, *d*, *f*, *g*, and a high impedance drop signal $S^3$ is bridged, with a condenser in the bridge. In this condition the cord may be used to connect magneto lines together, such as $L^3$ and $L^4$. In the jacks $J^2$ of these lines the test ring 5 makes contact with a sleeve $p^3$ on the plug, connected thru a third conductor *m* in the cord, to bat-



657,315. TELEPHONE SWITCHING APPARATUS.

Digitized by Google

tery $E^2$, and ground, so as to supply a test potential when the board is of the multiple type. Across the cord conductors *f g* is a bridge 8, 14, 21, 24, 28, 33, 25, which includes the impedance coils *r* and $r^2$, and battery $E^2$. The bridge also includes a pair of contacts 31-32, controlled by relay R. When this relay is excited the battery $E^2$ is removed from the cord, and the relay circuit is 26, $E^2$, relay resistance $r^4$, 27, and sleeve $p^3$ of plug $P^2$. When this plug goes into a magneto jack $F^2$ the battery current flows direct to ground from test ring 5, and energizes the relay to disconnect the bridge. On the other hand, when the plug is inserted in the jack J of a common-battery line, the current from battery $E^2$ finds a circuit to ground thru cut-off relay $R^2$, the resistance of which prevents current enough from passing to energize the low-wound relay R, and so the battery stays connected to furnish current for talking and signaling. The latter is accomplished by relay $R^4$, included in the bridge, and controlling lamp $s^4$, which constitute a supervisory signal.

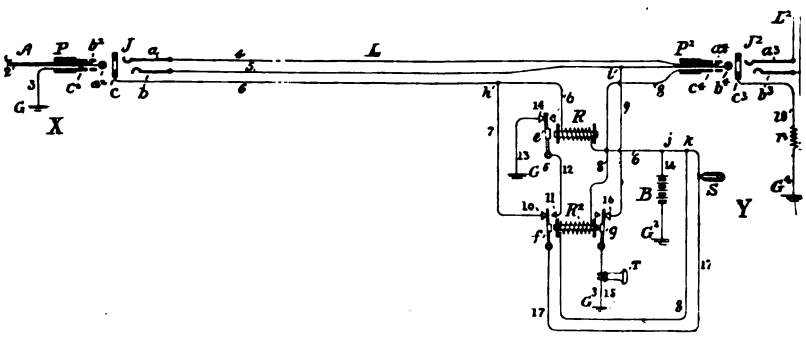
When connecting common-battery lines as L and $L^2$ or a common battery with a magneto line, the repeating coil I is brought in by means of key *k*. Springs *s* and $s^2$ spread and the two halves of the cord are separated and each completed thru one side of the coil, the key remaining down until released.

No. 657,316.—D. S. HULFISH. TELEPHONE TRUNK CIRCUIT.

This is a trunk signal system, when plug P, at station X, is inserted in trunk jack J, circuit is completed from ground G by wire 3, sleeve $c^2$, jack ring *c*, and wire 6 to wires 7, 17, and lamp S to battery B and ground, lighting the lamp as an advance signal. A parallel path also exists from point *h* to relay R, wire 6, battery B, and ground, causing the relay to pull up its armature. When trunk plug $P^2$ is inserted in line jack $J^2$ relay $R^2$ gets current from battery B by the path 14, 8, $R^2$, 8, $c^4$, $c^3$, 18, *r*, $G^4$, $G^2$, and battery; this relay then breaking the lamp circuit at 10 and putting it on the armature *e* of relay R, by front contact 11. When the plug P is removed from jack J, the relay R is deënergized, its armature falls back, and lamp S again lights as a "disconnect" signal.

No. 657,338.—W. W. DEAN. CENTRAL BATTERY TELEPHONE SYSTEM.

This is a system wherein the common battery at central is placed in series with the lines instead of in a bridge, as in so many systems. The diagram is almost self-explanatory. *i* is a battery at the



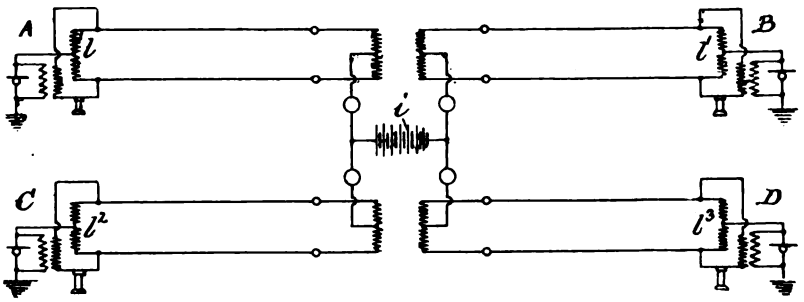

657,316. TELEPHONE TRUNK CIRCUIT.

central office, common to many lines. Each cord circuit contains a repeating coil, and from the middle of each winding of each coil a tap is taken to the battery. At the subscriber's station a coil is bridged across the metallic circuit, and a tap taken off to ground thru a divided path, the transmitter and the primary of the induction coil being in the two sides of this path respectively, and thus in parallel with each other.

Current flow in two connected lines is from the battery to the middle point of the coil in the cord, thence over the two sides of subscriber's line in parallel to

Digitized by Google

the substation, thence thru transmitter and primary in parallel to ground, to the other station, thru its transmitter and primary, thru line wires in parallel, thru two sides of coil in cord, and back to battery. The circles in the drawing are supervisory signals, which serve also as impedance.

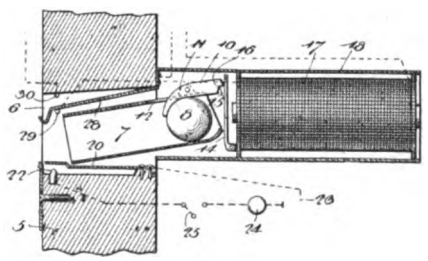



657,338. CENTRAL BATTERY TELEPHONE SYSTEM.

*September 11.*

No. 657,854.—O. R. CLINE. COMBINED TELEPHONE SIGNAL AND JACK.

This is a simple form of self-restoring annunciator and jack. The ball 8 is normally held as shown in the figure by the dog 10, whose end 16 is held up on the catch 15 of armature 14. When subscriber rings up, the armature releases



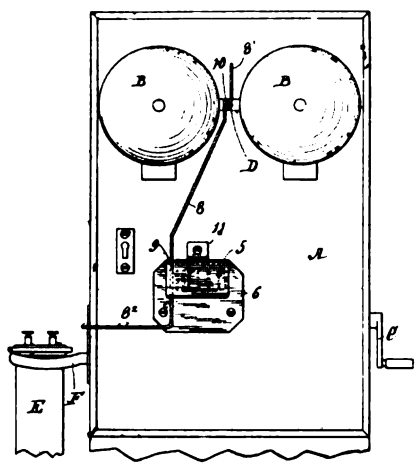
657,854. COMBINED TELEPHONE SIGNAL AND JACK.

the dog, the weight of the ball throws up the arm 11, and the ball rolls down the inclined tube 7 to show at the orifice 6; at the same time the weight of ball on spring 20 closes the night bell circuit at 22. The insertion of a plug of suitable shape in the tube 7 pushes up the ball and causes it to be caught by the dog and the latter to latch for another operation.

*September 18.*

No. 658,282.—J. M. SAILER. SIGNAL.

This is a simple bent metal shield 6 fastened to a ringer box, with a normally hidden slide 5, having two wire arms attached. One arm, 8, extends upwardly to catch over the ringer stem D, while the other, $8^2$, overhangs the switch hook F. When the bell rings the drop falls, and when the call is answered and the hook F rises, the drop is thereby pushed up and restored.




658,282. SIGNAL.

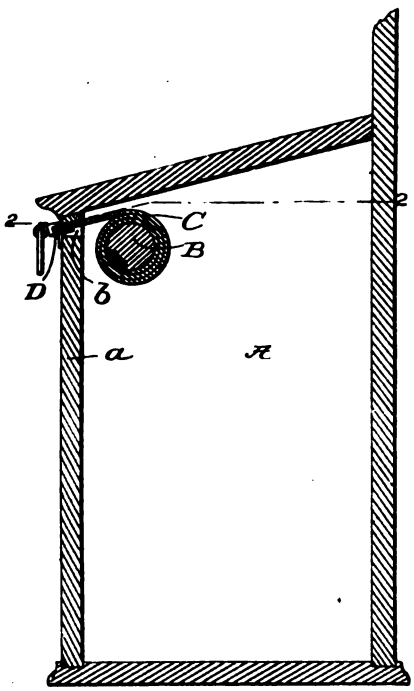
*September 25.*

No. 658,612.—W. J. BELL. TELEPHONE DIRECTORY.

This is a Hartshorn shade roller with a directory printed on the shade (or roll). The latter is pulled out thru a

Digitized by Google

slit *b*, by a handle D, when it is desired to consult the directory. The invention




658,612. TELEPHONE DIRECTORY.

lies in a flat metal clasp to fasten the roll to the stick.

## SOME TELEPHONE RATES.

Frequent inquiries reach THE TELEPHONE MAGAZINE regarding the rates of municipal telephone exchanges. Brighton, England, has an exchange which covers the average set of conditions. In the Brighton municipal telephone license the minimum rate for an unlimited service has been fixed at $22.50 per annum. For limited service $7.50 per annum, and a toll of 1 cent per call. These rates look remarkably low to the American producer, but even our English friends put the red peaches on top of the telephone basket. These rates, whether limited or unlimited, apply only to subscribers not more than one mile from the nearest switch room. Any excess distance is to be charged extra at a rate not to exceed $6.25 per quarter mile or fraction thereof per annum.

The charges for the use of public call offices are to be within the following limits: maximum 4 cents, minimum 1 cent per message.

---

Direct telephonic communication will be established between London and Brussels and finished early next year, with a rate of $2 for three minutes' conversation.

Comparison with this rate is shown in that established by the new Independent line between Wabash, Indiana, and Indianapolis, completed September 24, which is 40 cents for five minutes, as against 55 cents for three minutes charged by the Bell Company.

## PENNY-IN-THE SLOT.

Staid old London is giggling girlishly telephonically. Two English electricians, Mr. C. J. Bayard and Mr. Arthur Lamkin, both well known in the field, have invented a penny telephone call. In this ingenious instrument the dropping of a penny calls up the central exchange.

The machine is automatic and if the user does not want to bother with hunting loose change every time he calls any one up he can have each call registered against his number by a ratchet wheel indicator.

What is probably the best feature of the machine is, that if one puts a penny in the slot, or the machine has a call indicated against your number, and the person called up can not be put in communication with the caller, the telephone operator can cancel the indication or make the instrument return the penny by switching in an auxilliary current.

A perfect working instrument of this kind would greatly broaden the scope of existing telephone rentals.

---

"Certainly, I'll renew my subscription; it's my bread and butter in the business. Enclosed find $1 in payment."

F. A. R.

---

"Am more than satisfied with it, and am endeavoring to induce others in the same line of work to subscribe."

JAMES S. ALEXANDER.

Digitized by Google

## RECENT PUBLICATIONS.

"In the type-case of the printer, all the wisdom of the world is contained, which has been or ever can be discovered. It is only requisite to know how the letters are to be arranged. So, also, in the hundreds of books and pamphlets which are every year published about ether, the structure of atoms, the theory of perception, as well as on the nature of the asthenic fever and carcinoma, all the most refined shades of possible hypotheses are exhausted, and among these there must necessarily be many fragments of the correct theory. But who knows how to find them?

"I insist upon this in order to make clear to you that all this literature, of untried and unconfirmed hypotheses, has no value in the progress of science. On the contrary, the few sound ideas which they may contain are concealed by the rubbish of the rest; and one who wants to publish something really new — FACTS — sees himself open to the danger of countless claims of priority, unless he is prepared to waste time and power in reading beforehand a quantity of absolutely useless books, and to destroy his readers' patience by a multitude of useless quotations."—HELMHOLTZ.

ELECTRICITY MADE SIMPLE. By Clark Caryl Haskins. Paper; 5 by 6½ inches; 233 pages, 108 illustrations. Published by Clarence Macdonald, Chicago, 1900. Supplied by THE TELEPHONE MAGAZINE.

Almost every one identified with the electrical field in this country knows Mr. C. C. Haskins. He was a telegraph operator when many of the present fathers of electrical development wore kilts. He has aided many young men in obtaining their electrical education and the dedication to his "many friends in blouse and overalls" is apt.

We know of no one man in the electrical field who is better equipped thru wide and varied experience in his profession to write intelligently and clearly on the subject and the fact that he has done so will add many a subscriber to the first edition.

The book is written for the practical man who has neither the time nor inclination to understand the scientific working out of an electrical theory, buf who wants to have the facts at hand. The author has been more than successful in this undertaking and the book will prove interesting reading to others than those for whom it was directly written.

There are many books on the science of electricity, but few employing the simple form of expression necessary for the comprehension of the daily worker and yet not written with the schoolboy suggestion of a small collection of brain fiber on the part of the uninstructed layman. Written in an easy, plain sort of style, it will appeal to the average reader in a way that is bound to make the book successful.

ELEMENTS DU CALCUL ET DE LA MESURE DES COURANT ALTERNATIFS By Omer de Bast Paris and Liege, 1900 Ch. Beranger. 190 pages, 75 illustrations.

In this book the salient points of the course in electricity given at the Industrial School of Liege are assembled and give in condensed form the easiest methods of measuring and of calculating alternating currents.

In defining these methods the author has restricted the use of the differential and integral calculus and confines himself to examples which are readily understood by those whose arithmetic may otherwise be lost in an algebraic haze. This will probably appeal to many who have found themselves foundered in alternating-current calculations that are beyond their grasp.

The author shows clearly the relation between the electrical values in alternating circuits taking up in sequence the variations in the electromotive force between two points in a circuit, the watt capacity at different parts of the circuit, the power factors as determined, and the grouping of polyphase distribution.

This is followed by a number of problems worked out in detail, showing the application of the above in practice, which should prove very useful to the student for whom the book is evidently intended.

The latter part of the book is devoted to the measurement of alternating values, with short descriptions of the instruments usually employed.

While the author makes no pretension of a complete treatment on the subject, which of course could not be covered in a book of the size, yet in a clear and comparatively simple way he gives the main principles involved and an easy method of computing their relative values.

---

FIRST in importance in the field of general literature is the long expected "American Anthology" of Mr. E. C. Stedman, and next in interest to the student of American literature will be the ambitious "Literary History of America," upon which Prof. Barrett Wendell has been long engaged. Other items of interest in this category are a new volume of essays by Count Tolstoi, "The Life and Times of Omar Kháyyám," by Mr. Denison Ross, and an English translation of M. Rostand's "L'Aiglon."

Digitized by Google

## THE PARIS EXHIBITION, 1900.

[From the *Engineering Times*, London, England. Ben. H. Morgan, editor.]

The greatest industrial exhibition the world has ever known is now being held in Paris. The whole human family has there assembled its finest productions and shown what it is capable of in science, industry and art. A landmark in the history of civilization, this exhibition marks the state of human progress at the beginning of the twentieth century.

### HISTORICAL.

From the earliest times exhibitions have been recognized as aids to the best of human achievements. The Olympic games had their industrial features, while the great fairs of Nijni-Novgorod, Astrakan, Prague, Leipsic and other cities were regarded to a large extent as periodic exhibitions of industry, where might be seen in manufactures the latest contributions of science.

But the honor of first establishing industrial exhibitions as we know them, belongs to France, and curious it is that the idea is a creation of a stormy period of the Revolution. In the year V. of the Republic (1797) the three great government manufactories of France, namely, the porcelain works of Sèvres, the tapestry works of the Gobelins, and the carpet works of the Savonnerie — had fallen into utter disorganization. At this time the Marquis d'Avèze was appointed Commissioner for these national establishments, and, struck with their wretched condition and the penurial state of their operatives, sought to raise the status of both by forming an exhibition of the choicest specimens of the productions of these manufactories. Obtaining the use of the Château of St. Cloud, he covered the floors with the superb carpets of the Savonnerie, hung the walls with Gobelin tapestries, and adorned the saloons with the finest examples of Sèvres porcelain. A system was planned to raise a fund for the benefit of the starving workmen by sales and lotteries. The day before the opening, however, a decree of the directory was published banishing the nobles of France from Paris and its vicinity. In this proscription the Marquis was included, and so the exhibition was never opened to the public.

In 1798 the Marquis returned from his proscription, and immediately made preparations for a second industrial collection. On this occasion he not only collected the productions of the three national establishments, but those of leading manufacturers, and a successful exhibition was held in the Maison d'Orsay, Rue de Varennes.

These two exhibitions, the work of one individual, were speedily followed by others under Government patronage. In the same year Napoleon built a "Temple of Industry" in the Champs de Mars, where stands part of the present exhibition, wherein a large collection of manufactures was got together. This was the first National Exposition, and the first one where a jury were appointed and prizes awarded. It was followed in 1801 by another National Exhibition, at which the historical Jacquard loom was first shown. The next year (1802) witnessed the third National Exposition, which was notable for the evidences of progress which had been made in the applications of mechanical and chemical sciences. The fourth took place in 1806 on the Esplanade of the Hôtel des Invalides, and the fifth National Exposition in 1819. This was held in the Louvre, and it is recorded that Jacquard was again a prize-holder, and that metal works in steel, iron, bronze, plated goods, gold and silver exhibited a good advance in skill. The next exhibition was also held at the Louvre in 1823. It was here that a model of the first suspension bridge proposed was exhibited by Seguin Frères. This bridge was afterward built across the Rhone.

The seventh National Exposition was held in the Louvre in 1827, and exceeded all its predecessors in magnitude and duration. "The steam engine and its *wonders* told more significantly in this exposition than in any former one." The eighth exposition was organized in 1834, and the ninth followed in 1839, at which nearly fifty steam engines, by different French makers, were exhibited, whereas in 1802 there were not twenty steam engines in all France. The following exhibition in 1844 was remarka-

Digitized by Google

ble for the increased display of heavy moving machinery. Nasmyth's hammer was here first shown abroad. The eleventh French exposition followed in 1849.

The increasing interest and industrial gain which attached to these successive French exhibitions naturally attracted the attention of other countries, and so it was that in 1839 the Mechanics Institution in Manchester organized an exhibition of manufactures. The Manchester institution was followed by similar ones in Leeds and Liverpool, where exhibitions were held in turn. Previous to these, minor displays of manufactures were held in England by the Society of Arts, Asiatic Society, United Service Institution, Adelaide Gallery of Practical Science and the Polytechnic Institutions, but these could not properly be called "exhibitions."

The first Government to imitate France was that of Bavaria in 1845, who provided the first permanent building for the holding of industrial expositions. Nearly all European countries followed Bavaria in turn, and industrial exhibitions soon came to be recognized as important aids to national prosperity. And here, after a few remarks concerning the exhibition of 1862, I will end my short reference to early exhibition history.

In looking over a record of the great exhibition of 1862, it is interesting to find that some of the leading engineering exhibitors who took part in that exhibition have now some of the best displays in the British section of this Paris exhibition. I refer to Fowlers, of Leeds, Howards, of Bedford, Hornsby, of Grantham, Ransomes, Sims and Jefferies, of Ipswich, Garretts, of Leiston, Neilson Reid & Co., Platts, of Oldham, and others. And it is remarkable that some of the types of machines which these makers exhibited, and have since discarded, are the specialties of continental makers, and are now being exhibited. For instance, in the year 1862 exhibition Messrs. Ransames, Sims and Jefferies exhibited a portable engine having as a special feature a removable tubular boiler.

### EXTENT OF THE EXHIBITION.

This exhibition covers a total superficial area of 550 acres, while the area occupied by buildings and covered in amounts approximately to 5,000,000 square feet. There are 100 French and 75 foreign pavilions and detached buildings, in addition to which there are 36 official pavilions of nations participating in the exhibition, besides a number of miscellaneous detached buildings erected in the grounds. In this exhibition the different nations' manufactures are not displayed separately, but side by side with each other, and the visitor is therefore able to make comparisons of the different exhibits. But it is not our intention to deal at length with the internal arrangements of the exhibition; from guide-books and the like the public are already sufficiently informed on the subject.

### GERMANY'S ENTERPRISE.

There is one thing that must strike every engineering student of the Paris Exhibition, and that is that Germany is a more serious competitor than she has hitherto been regarded. By this is meant that in regard to this exhibition she has played a better and more enterprising part than we have ever considered her capable of. When the French Government invited the world's nations to exhibit their productions in Paris, Germany recognized that a great responsibility went with the acceptance of such an invitation, and so has she left no stone unturned to appear at her best. She voted a grant for her representation of not less than £250,000, nearly three times that of Great Britain. Having decided to participate, she at once set to work with a will, and the result is that she is better represented at the exhibition than any other foreign nation, excepting France herself.

### GREAT BRITAIN'S PART.

Contrast the action of Great Britain with that of Germany. Starting with a feeble grant, we have played a most unenviable part. From the start there has been no lively interest, no attempt to give Great Britain her proper place among the nations. The "boycott" movement — which we then stigmatized as an industrial crime — is no doubt accountable to a large extent for the almost contemptible share we are taking

Digitized by Google

in this great show. The standing of the different nations at Paris, and the unrepresentative part that Great Britain is playing, will readily be understood from the following comparative table of exhibits showing what each nation is responsible for :

| | |
|---|---|
| France | 30,000 |
| United States | 6,564 |
| Belgium | 2,500 |
| Germany | 2,000 |
| Italy | 2,000 |
| Russia | 1,500 |
| Scandinavia | 1,400 |
| Austria | 1,000 |
| Great Britain | 600 |
| British Columbia | 600 |

The New York *Times*, commenting on England's want of enterprise, remarks : "England, from whom much was expected, is at the bottom of the list, and the United States is second only to France. American enterprise will surely be rewarded by a big increase in her foreign commerce." I recommend the "boycott" press to again consider that question in the light of the exhibition ; the poverty of their judgment will not fail to strike them.

The result is now that we appear in the show as an advantageous set-off to other nations. To say that we are represented would be absurd, and yet foreign buyers will think we are — and there is the sting. Our representation will not compare with that of Switzerland, and as for those of France, Germany, Austria, America and Russia, I say there is no comparison. Not that there is anything inferior in the design, capacity, economy or workmanship of our machinery, but that we have not sufficient of it ; and, what is more important, representative firms making representative machinery have refrained from exhibiting, and the result of it all will be a reflex action upon British export trade. It will be a big penalty that we shall have to pay in the long run, but it is one of the natural consequences of Great Britain's cultivation of a sensational press. And now, having pointed out more for the guidance of foreign readers than English ones the unrepresentative character of our exhibits and the reason therefor, it is not desirable here to dilate further on the matter. I must add, however, a word in regard to our Royal Commission. Much blame must be attached to this body for the way it has done its work. As though tainted with "boycott" views, it seems to have gone about its duties in a half-hearted, spiritless manner, with an apparent failure to grasp the importance of the affair it was dealing with. What possessed the Commission to ask Parliament for £75,000, when Germany voted £250,000, and other nations similarly large amounts? Would the man in the street have felt it if we had voted £500,000? Certainly not, except in a reflex beneficial way. Having decided to participate in an International Exhibition, Great Britain should have carried the matter thru with her characteristic thoroness.

Just as we go to press I learn that the London Chamber of Commerce has appointed a committee to report on the British representation, and the work of our Commission. This is a step in the right direction, and we hope this inquiry will result in the fixing of responsibility for the disgraceful manner in which British commercial interests have been trifled with at this great exhibition. We trust also that this committee will not lose sight of the points dealt with in our last issue, regarding the arrangement of exhibits and other details in the handling of which so much incapacity has been shown.

### AMERICAN REPRESENTATION.

The effect of the Dreyfus agitation is also reflected to some extent in the American representation. They, too, were carried away for the moment, but the practical American mind was quick to recognize the fatuity of such a policy, and the energy she has since displayed in perfecting her arrangements shows that she recognizes the potency for evil of a bad comparison. Being dissatisfied with the amount of space allotted to her in the Champs de Mars, she applied for and obtained power to erect a special building at Vincennes for the display of machinery in motion, principally that machinery for which she is well known, namely, machine tools, pneumatic tools, mining and wood-working machinery. The addition of this building to Amer-

Digitized by Google

ica's representation gives her considerable importance, and stands as a monument to her enterprise.

MACHINE TOOLS.

As I have remarked, in no department of engineering is Great Britain adequately represented, and least of all in this section. Her representation is in the hands of about six first-class firms, when she could have sent probably a larger number of high-class machine tool-makers than any other conntry, for, despite all that has been said about foreign competition in this connection, we are still in the front. And, as it now is, the foreigner will point to our little show and cynically remark, "*Voici l'effet du concours.*" And at the same time we boast such firms as Muirs, Greenwood and Batley, Archdale, Lang, Sharp, Stewart, Buckton and many such others. Why are these not representing us? My query is a lament. Had we gone there in force we should doubtless have gained what prestige we lost in the recent American "boom." For a comparison of the British tools exhibited there with those of any other nation is, in my opinion, in favor of the former. The British tools are nearly as automatic as the American, besides being much sounder made; and the automatic features are obtained in the British tool with less complication, while the general design and workmanship leave little to be desired. The little show that we make is in itself decidedly British, the large, heavy proportions denoting long life, strength and accuracy, strongly contrasting with the American and German article.

It must be said of Germany, however, that she is making a decided advance in one direction — in favoring electricity as a motive power in the use of machine tools. She exhibits quite a large number of electrically driven tools, and these tools are not mere adaptations to accommodate a motor, but are designed with the motor incorporated in the machine, where it is entirely enclosed and free from dust and dirt. In the French section are some surprisingly fine tools, the examples of Bouhey and others being somewhat in the nature of a revelation.

STEAM ENGINEERING.

The whole of the steam power required in the exhibition is supplied from two boiler houses adjacent to the main machinery hall, each covering an area 344 feet long by 92 feet wide. These two houses have a steam capacity of 518,000 pounds per hour, which is considered ample for the 36,000 horse-power developed by the various engines. There are 92 boilers in the two stations, the majority of which are of the water-tube type, a few only being of the Lancashire or Cornish types. The total heating surface is approximately 160,000 square feet, which gives an average of 3.2 pounds of steam per hour per square foot of heating surface. The steam pressure at the boilers is 156 pounds per square inch, and at the engines 140 pounds.

LOCOMOTIVE PRACTICE.

The engineering section of Vincennes, tho most charmingly situated, is too far away to attract a very large number of visitors. In the building devoted to railway plants, Germany makes the best show, and beside it the English exhibit looks regrettably small. Notwithstanding this, however, there is no doubt that the English engines are much admired, not only from the standpoint of general design, but also on account of the workmanship and finish that have been put upon them. Austria and Italy have an interesting show of locomotives and carriages, while Russia also shows a number of queer designs. America is at a great disadvantage in this department, being properly represented by only one company. France is of course well represented, having no less than seventeen locomotives. Belgium also has a good show.

The best continental practice is undoubtedly that of the French builders. Their engines are much more compact and altogether better designed. The whole exhibition boasts a show of some sixty locomotives, and the new features characterizing the majority of these are, the coupling of driving wheels, use of compound cylinders, and the general adoption of the Walschaert valve gear with outside motion work. Germany

Digitized by Google

shows a triple expansion engine in which the problem of condensation is courageously attacked.

There are a few decided novelties in locomotive construction, but they are not going to affect the general practice. One is a four-coupled compound express engine by a German firm, with a steam-driven bogie in front. Another is a six-coupled compound express engine by an Italian firm, having a four-wheeler bogie directly under the cab, which is treated as the "front" of the engine. The other is a very large locomotive by Schneider & Co.

### "FLOHR" ELECTRIC CRANE.

This is one of the landmarks of the engineering section in the Champs de Mars. It consists of two vertical trellis-work members 12.50 meters in height, connected by two straight beams of similar construction, which are surmounted by a latticework parabolic arch. The uprights are 27 meters apart. On the two horizontal beams moves the carriage, which bears a windlass capable of raising a load of twenty-five tons at the rate of 2.4 meters per minute. This crane, which is also a rolling bridge, can be moved along the hall for a length of 107 meters. It is controlled entirely by electricity.

### MOVING PLATFORM.

This ingenious invention removes to a large extent the discomfort experienced by visitors in the past to a great exhibition, as a satisfactory means of transport has long been needed. The moving path, in addition to supplying this want, forms one of the attractions of the exhibition. One of its special advantages is, that it does away with the waste of time and annoyance of waiting which is usual in the case of trams, trains or omnibuses. The traveler can step at once on to the platform, and can either remain still and be carried to whichever point he is desirous of alighting at, or walk as well, which naturally increases the rate of speed at which he travels. The system, which is an overhead one, comprises three platforms. The first platform is fixed; the second is three feet wide, and moves at the rate of about two and a quarter miles an hour; while the third is six feet in width, and passes along at the rate of four and a half miles an hour. The platform has a length of over two miles, and forms a most comfortable and agreeable mode of transit.

### THE GREAT TELESCOPE.

The great telescope, constructed by M. Gautier, the well-known optical instrument-maker, is a very bold piece of work. Its tube is 197 feet in length, and the diameter of lens 49 inches. The mirror has a diameter of 78½ inches and a thickness of 11 inches. The siderostat carrying the mirror weighs no less than 22½ tons, and is built of seven cast-iron pieces bolted together. This monster instrument can clearly show the movements of flame on the sun, and can bring the moon within a distance of fifty miles from the earth.

### CONCLUSION.

This exhibition is one which should be studied by every engineer. There are "points" to be picked up. In many departments of engineering the continental exhibits there will appear as a revelation to the British manufacturer. The "boycott" press are crying this exhibition down and pronouncing it to be a failure. Nothing can be more unfair. As an exhibition of manufactures it is a huge success, and should be seen by every one.

An immense amount of work has been entailed in the production of this issue, and as the time available has been limited I trust that readers will excuse any errors that may be met with.

There is another point on which I should like to say a word. It has always been my endeavor to make *The Engineering Times* unmistakable. I would now say that in this number, apart from this introduction, there is no expression of editorial opinion. The machinery has been described from personal observation, and from particulars supplied, and anything savoring of editorial opinion on the merits of any machine, appliance or process must be regarded rather as the opinion of the manufacturer. In the matter of signed articles, the editor likewise disclaims all responsibility for the opinions expressed.

Digitized by Google

# INDEPENDENT ITEMS.

MASSILLON, OHIO.—The Massillon Telephone Company has been incorporated, with $75,000 capital stock, by E. E. Fox, J. W. Clymonds, J. A. Hunt and others.

ALBION, IND.—The Noble County Telephone Company has been incorporated, with a capital stock of $15,000. T. A. Houston is president of the board of directors.

HONEY GROVE, TEXAS.—The Honey Grove and Ragsdale Telephone Company has been incorporated by J. A. Underwood, P. M. Price and T. U. Cole. The capital stock is $1,200.

ATHENS, OHIO.—The Athens County Telephone Company has been incorporated to construct and operate telephone lines. The capital stock is $15,000, and the incorporators are C. L. Jones, G. W. Duffee, W. E. Moler and others.

INDIANAPOLIS, IND. — The Noble County Telephone Company has filed articles of association with the Secretary of State. Capital stock, $15,000. The company will construct a line in Noble county.

AKRON, OHIO.—The Akron Peoples' Telephone Company will soon be given long-distance connection with Columbus, Pittsburg, Medina and Canton over lines being built by the United States Telephone Company.

TOLEDO, OHIO.—The Ottawa County Telephone Company, Oak Harbor, has been incorporated. Capital, $30,000. Incorporators: H. Metzgar, E. D. Harkness, J. G. Steinkamp, T. Fuller and F. W. Gradolph.

NORTH RIDGEVILLE, OHIO. — The North Ridgeville Telephone Company was incorporated recently, with a capital stock of $2,000. The incorporators are J. P. Riedinger, H. F. Culver, E. F. Allen and others.

STAUNTON, ILL.—The Staunton Telephone Company has been incorporated to operate telephone lines, with a capital of $2,400. The incorporators are C. R. Wall, S. P. Williamson and C. Godfrey, all of Staunton.

ALBANY, OHIO.—The Albany and Vales' Mills Telephone Company has been incorporated to do a telephone business. The capital stock is $10,000, and the incorporators are J. Q. A. Vale, L. P. Vale and D. L. Webb.

GREENSBURG, IND. — The Greensburg Telephone Company has been incorporated, to operate telephone lines, by W. B. Hamilton, D. A. Myers, A. P. Bows and others, all of Greensburg. The capital stock is $30,000.

GIRARD, GA.—The Girard Telephone Company has been incorporated to construct telephone lines. The capital stock is $2,000, and the incorporators are Charles Brigham, J. B. Heath, H. A. Buxton and J. O. Mathews.

SANBORNTON, N. H.—The Sanbornton Telephone Company has been incorporated to operate a telephone line, with a capital stock of $1,150. The incorporators are J. N. Sanborn, W. D. Sanborn, O. M. Smith and others.

IRONTON, OHIO.—The Lawrence Telephone Company has been incorporated to construct and operate telephone lines. The capital stock is $24,000, and the incorporators are W. B. Seaton, J. L. Anderson, H. Russell and others.

SHERIDAN, IND.—The Central Indiana Telephone Company was incorporated recently. The capital stock is $10,000, and the officers are: President, J. H. Cox; treasurer, J. D. Cox, and secretary and manager, L. D. Cox.

JERSEY CITY, N. J.—The Exchange Telegraph Company has been incorporated to operate telephone and telegraph lines. The capital stock is $5,000,000, and the incorporators are A. Smedberg, L. B. Dailey, C. W. Perkins and others.

FARMLAND, IND. — The Farmland Telephone Company, of Farmland, has been incorporated to operate telephone

Digitized by Google

lines. Capital stock, $10,000; incorporators: T. W. Botkin, W. C. West, H. D. Good, J. T. Wright and J. Nixon, all of Farmland.

SALAMANCA, N. Y.— Virgil Hayden has organized local companies at Salamanca and also at Akron, New York, and will begin the erection of exchanges at both places at once. The company at Salamanca is capitalized at $5,000; the one at Akron is incorporated at $10,000.

WARSAW, IND. — The Commercial Telephone Company, of Warsaw, has been chartered to build lines and operate exchange. Capital stock, $30,000; incorporators: J. A. Widaman, O. Oldfather, C. M. Burkett, S. W. Chipman, C. E. Wahl and M. R. Williams, all of Warsaw.

NEW YORK, N. Y.— The Lambert Schmidt Telephone Manufacturing Company, principal office 93 Maple street, Weehawken, New Jersey, has been incorporated. Capital stock, $50,000. Incorporators, Lambert Schmidt, Samuel B. Fowler, Walter W. Bostwick, Jr., and George Fritz.

MASSILLON, OHIO.— The Massillon Telephone Company, with a capital stock of $75,000, has been organized, and the plant of the Farmers' Telephone Company of this place has been purchased by the new company. The new company is allied with the Columbiana County Telephone Company.

RAVENNA, OHIO.— The business men of this city have sent a signed notice to the Central Union Company that on October 1 they will discontinue the use of their Bell telephones and will thereafter use the service of the Ravenna Home Telephone Company, a corporation controlled by local people.

KOKOMO, IND.—The New Independent Telephone Company has just completed their splendid plant costing $30,000, and starting with 425 subscribers. The Central Union Company is making a fierce effort to retain its subscribers, but the fight is a losing one for it and the Independents score another victory.

ALLIANCE, OHIO.— The new Stark County Telephone Company, under the management of Emmet R. Morgan, is preparing to build exchanges at Alliance and Canton, in conjunction with the Columbia County Telephone Company. These alliances help to make successful exchanges and paying properties.

DELMAR, PA.— The Delmar & Hoytville Telephone Company has been incorporated to operate telephone lines. The capital stock is $2,000, and the incorporators are C. A. Gorris, C. A. Stewart, C. Steel, all of Delmar, and D. H. Darby, of Hoytville, and F. W. Marvin, of Antrim.

HORNELLSVILLE, N. Y.— The Hornellsville Telephone Company has been incorporated to operate a telephone line between Hornellsville, Olean, Bath, Wellsville and intermediate points. The capital stock is $50,000, and the incorporators are B. G. Hubbell, Cleveland, Ohio; F. D. Sherwood and J. B. Day, Hornellsville.

GRANVILLE, OHIO.— Angry citizens cut the wires and chopped down the poles of the long-distance line erected thru their town by the United States Telephone Company. The company agreed to install 50-foot poles, but absent-mindedly used shorter ones, which damaged many fine shade trees — hence the public boomerang.

SIOUX RAPIDS, IOWA.— A telephone company has just been organized at Sioux Rapids, Iowa, composed of the following local business men: Messrs. P. J. Cilley, R. H. Hulett, A. Tymeson, Jr., and W. B. Mills, to operate and maintain a local telephone line in Sioux Rapids. The line will be built and put in operation in less than sixty days. The company will be incorporated under the name of Sioux Rapids Telephone Company.

RACINE, WIS.— The directors of the Citizens' Telephone Company, of Racine, Wisconsin, have elected the following officers: President, John B. Simms; vice-president, E. B. Belden; secretary, J. Breese; treasurer, Charles Carpenter. The contract for the construction of the system was awarded to Jones & Winter, of Chicago. They will get about $56,000 for the work. The work of construction will commence September 30, and the plant will be in operation about January 1.

Digitized by Google

## STERLING IMPERIALISM.

Our "new possessions" are swinging into line with true American spirit, as is evidenced by the growing export trade to these points. The Sterling Electric Company, of Lafayette, Indiana, reports closing contracts for four exchanges in the Hawaiian Islands, also business in Cuba, as well as several South American points.

FORT DODGE, Iowa, is one of the points where good Independent service is appreciated. The Fort Dodge Telephone Company of that city is growing rapidly and has just ordered the seventh section of switchboard and equipment of the Sterling Electric Company, who, we understand, furnished the original equipment of three hundred numbers less than two years ago. A gain of over one hundred per cent in so short a time is evidence of the popularity of the Fort Dodge Company and its service.

ERICSSON series No. 4 is out, and devoted to the circuits of the metallic switchboard. In addition to the description of diagrams, some interesting statistics are given about the number and kind of telephones used in the different countries of the world. The company will be glad to send it on request.

---

"I AM much pleased with your magazine and am recommending it to every one that is in the electrical field."—C. J. WRIGHT.

---

## STEAMER TELEPHONES.

The scheme of placing an automatic telephone pay station on board transatlantic steamers when at dock seems likely to be adopted generally.

A plug connection with the telephone system is inserted in its place on deck and no further attention is required except at the switchboard of the Hoboken Central office. The system gives to passengers sailing for Europe the opportunity to transact business on board up to the very moment of sailing. This appeals to the busy business man as well as to the romantic maiden who wants to say good-bye to the other fellow.

## PROGRESS OF THE EUREKA CO.

The Eureka Electric Company reports a rapidly increasing demand for its high-grade apparatus. Much of this success is no doubt due to the fact that in all of the apparatus placed upon the market no instrument or switchboard has ever been offered but what has been thoroly tried and proven.

Among the larger and most notable installations recently completed by the Eureka Company we find a thousand-capacity equipment for the County Telephone and Telegraph Company of Waterloo, Iowa; also an equipment for the Central office of the Niagara Falls, New York plant. The company has just furnished a large transfer equipment for Fulton, Missouri, and another for McPherson, Kansas.

The company reports to have in operation at present over seven hundred high-grade Eureka metallic switchboards, all of them being equipped with the self-contained, self-restoring removable cam. In large installations the special improved devices of pilot systems and supervisory calls are used.

The Eureka new No. 1 special transmitter is claimed to possess special features of merit over others on the market, not being liable to any harsh or rasping sounds under very heavy battery.

---

ENGINEERING AT THE PARIS EXHIBITION.

Never before has such a stupendous collection of machinery been assembled as that which is now being exhibited at the Paris Exhibition. There is to be seen there in full-size machinery, models and drawings, the world's best and latest practice in every department of engineering—civil, mechanical and electrical. To make a scientific record of all the leading features of this is the task undertaken by the *Engineering Times*. This record will be published during the coming month and will obviously be of immense value to engineers in this country. It is a gigantic task, and if it is as well performed as it promises to be, the work will most probably be the standard one on the engineering exhibits of the Exhibition. The price will be half-a-crown, and every copy will be beautifully printed on art paper. This will be a book for which it will be worth placing an order in advance.

---

WE can not do business as well without your magazine as we can with it."

B. F. WASSON.

Digitized by Google

## Wanted.

POSITION by experienced young man, able to take care of exchange. Familiar with every detail of work, including toll and trunk lines. Address,

C. C.
TELEPHONE MAGAZINE,
Chicago, Ill.

---

POSITION as manager and electrician for exchange of from 200 to 300 subscribers. Experience in construction, operation and maintenance. Best references. Address

O. M.,
Care TELEPHONE MAGAZINE.

---

POSITION, by a No. 1 all-round man, as superintendent or manager of a telephone exchange. Up-to-date and thoroly posted in all branches of the business. Married; strictly temperate, and a hustler. Eleven years' experience. Very best of references. Address,

H,
TELEPHONE MAGAZINE,
Chicago, Ill.

---

**Charles A. Brown & Cragg,**

**ATTORNEYS AT LAW and SOLICITORS of PATENTS,**

**1450 Monadnock Block, CHICAGO.**

---

EDWARD E. CLEMENT. WM. D. GHARKY.

**CLEMENT & GHARKY**

**Patents and Patent Law**

**GENERAL ELECTRICAL EXPERTS**

**SEARCHES, REPORTS, OPINIONS**

Stephen Girard Building, PHILADELPHIA. McGill Building, WASHINGTON, D. C.

---

**The Inland Printer**

$2.00 per Year.
20c. per Copy.

Published Monthly...

The Leading Trade Journal of the World in the Printing and Allied Industries.

NO matter what line of trade you are in, if you like nice printing or have anything to do with advertising or art work, this magazine will be a most valuable aid. Every issue is a gem. You need it. Send 20 cents for a sample copy. It is worth double that price.

**The Inland Printer Co.**
PUBLISHERS,
212-214 Monroe Street,
CHICAGO.

---

"Imperious Caesar!
Dead and
turned to clay-"

McRoy leonduits
may not have
such an
origin, but
they are
worthy of it.

JOHN T. McROY
302 BROADWAY, NEW YORK
138 WASHINGTON ST., CHICAGO


Digitized by Google

# Telephone Magazine

Copyright, 1900, by Electrical Engineering Pub. Co. Entered at the Chicago Postoffice as mail matter of the Second Class.

VOL. XVI. CHICAGO, NOVEMBER, 1900. NO. 110

## TELEPHONE SWITCHBOARDS.

BY H. P. CLAUSEN.

(*Continued.*)

Apropos to the writer's reference in the previous section of these articles defending the stand he took in reference to the comparative desirability of a full central energy or full centralized call exchange system, the following extracts of a letter received by him from the manager of a large exchange system might be of interest, and further discussion is invited upon this interesting point:

"Your last article in the current number of THE TELEPHONE MAGAZINE (referring to the October issue) was interesting to me, inasmuch as it supports the contention I have been making for some time that from the point of economy in first cost and maintenance, as well as quality of service, both local and long-distance, a centralized calling system is far superior to a full central-energy exchange. . . . We have been using dry cells exclusively. The average life is about nine months, two cells being used in each telephone, and in some cases they have been removed after thirty-two months of service and showing an e.m.f. of three-tenths of a volt."

In addition to the above, the writer of the letter asks at what voltage it would be advisable to discard a dry battery, and at what voltage a bell-hanger might make use of the dry cells. In answer to the first question, it might be suggested that a battery should not be permitted to drop below three-fifths of a volt, for after a cell gets down to that voltage it will not stand up sufficiently well during long conversations. Tho it is greatly a matter of opinion, the writer believes that three-fifths of a volt is low enough for warranting the cell being discarded, and, at the same time, such cells can be adapted for service in a great many different directions by bell-hangers and other users of current which is only required to be used for a few seconds at a time.

In order to further discuss this matter, it is suggested that exchange managers using dry cells in their telephones enter into discussion of this interesting subject by writing THE TELEPHONE MAGAZINE their experiences with dry batteries for telephone service.

Now that we have considered the means that may be employed for connecting together two or more telephone circuits, we must consider the means for communicating with the calling subscriber and also establishing a communication with the called-for subscriber. Referring to Fig. 4, O P represents an ordinary telephone, one side of which is connected to the ground and the remaining side to the plug P. The diagram further shows the telephone T connected to the drop D and jack J. Upon the operator receiving a call, recorded either by the falling of an annunciator drop, the ringing of a bell or any other suitably arranged signal, the plug P is placed into the jack J and connection established between the operator and calling subscriber's circuit. In case that the subscriber T had been required to be called, the P plug would have been placed into the J jack and the signal-current generator of the O P operator's telephone driven, thus projecting a signaling current over the circuit.

This form of operator's equipment answers very well for small exchanges or

Digitized by Google

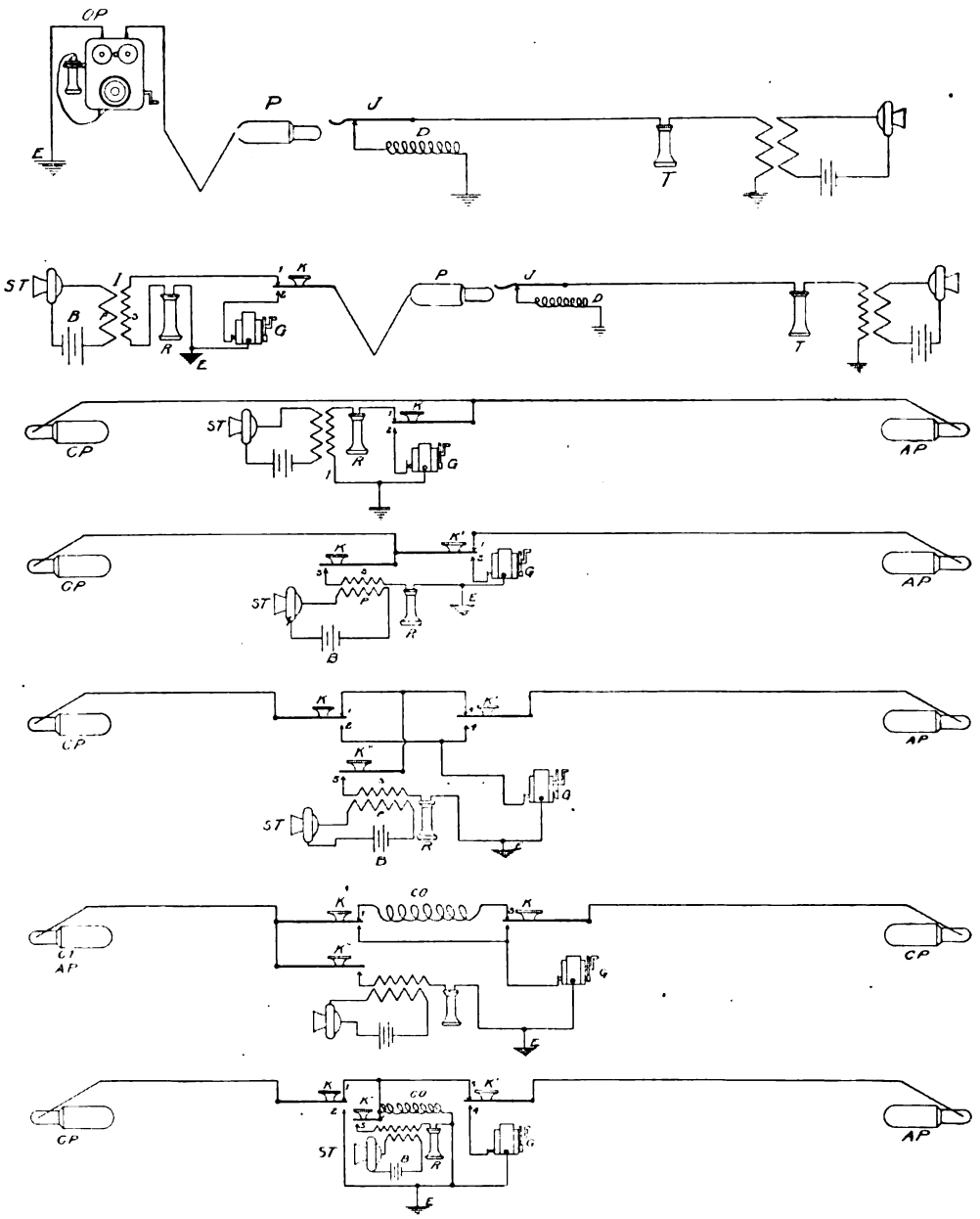



FIG. 4.

Digitized by Google

intermediate toll-station switchboards, where there are several circuits terminating at the switching station. In case, however, that the board is provided with, say, eight or ten line terminals, it becomes necessary to provide a more suitable form of an equipment. Thus, referring to the second diagram, the same telephone circuit is shown connecting to the drop D and jack J. But, in place of the operator's telephone, it will be observed that the P plug is attached to a push-button K; the back or resting contact 1 of this push-button, as it will be observed, connects to the secondary winding S of the induction coil I, receiver R and ground E, the primary circuit of this equipment comprising the transmitter S T, battery B and primary winding P. Now then, an incoming call is answered by the operator placing the P plug into the jack J. This connects her operator's set to the telephone circuit in readiness for receiving the subscriber's instruction. In transmitting a calling current, the button K would be depressed, its spring making contact with 2 and thus permitting the projection of a calling signal while the generator G is driven. The above equipments are, of course, required to be used in connection with all of the diagrams shown by Fig. 3, October number, page 130.

The third diagram, however (Fig. 4), shows a system in which the operator's answering and calling equipment is combined together with the subscriber's interconnecting cords and plugs. Thus C P represents the calling, A P the answering cord, while K is connected directly to the thru circuit, leaving the operator's equipment S T normally connected to the thru circuit. This form of an equipment, however, can only be used where there are but two circuits to be connected together, as the operator's equipment is normally left connected and might have some signaling device which would operate whenever a clearing signal is received from one of the interconnected subscribers.

Another feature of the third system of interconnection is, when the K button is depressed for the purpose of signaling, the signaling current is projected over both the C P and A P plugs. This, of course, is undesirable, and may be overcome by using the fourth system of interconnection. Referring to the diagram, plug C P and A P are normally in connection with each other. When an operator answers a call, the A P plug is used and the K button depressed, which connects the operator's set to the circuit. After learning the subscriber's request for connection, the C P plug is placed into the called-for party's line jack and the K′ button depressed, which connects the C P plug circuit to the generator D thru the contact 2 to the exclusion of the A P plug circuit. Thus the signaling current is projected over the called-for party's line circuit only.

Neither of the above equipments, however, shows any means for signaling out over the calling and answering plugs separately. This is shown by the fifth diagram, where the C P plug is connected to the push-button K and thru the resting contact 1 to the resting contact 3, push-button K′ and from there to the plug A P. With this construction, a signaling current may be projected over the C P plug circuit by depressing the button K, and that to the exclusion of the A P circuit; and, vice versa, a signaling current may be projected over the A P plug circuit by depressing the K′ push-button to the exclusion of the C P plug circuit. In this system of connection the operator's circuit is cut in parallel with the cord circuit by means of a push-button K″, which connects to both of the resting contacts 1 and 3. This system of connection is the form most generally used, with the addition, however, of some sort of a clearing signal. Thus, referring to the fifth diagram, the 1 and 3 contacts of the push-buttons K and K′ are not connected directly together as in the previous diagram. That is, the 1 contact point connects to the 3 contact point thru the clearing-signal C O. Thus, a signaling current passing from A P to C P would have to go thru the winding of the clearing-signal and thus produce a preunderstood disconnecting signal. The provision of a series clearing-signal, however, is not desirable, as was explained in referring to the eighth diagram of Fig. 3. Therefore, Fig. 7 shows a system in

Digitized by Google

which this objectionable feature is overcome by using a clearing-signal connected as was shown and described in the ninth diagram of Fig. 3. Referring to the seventh diagram of Fig. 4, the C P and A P plugs are connected directly thru the contacts 1 and 3, push-buttons K and K', while the clearing-out drop connects to the resting contact circuit together with the operator's listening-in key.

In order that the reader may obtain a better understanding of interconnecting systems and operator's switching appliances regularly used in connection with most switchboards now in service, Fig. 5 has been prepared. It will be observed that the answering and calling plugs are normally in connection with one another. Thus, tracing out the circuits, T connects to the spring T S by means of the wire W and thru the resting contact 7 to the resting contact 4, spring 5, resting contact 8; spring C T, wire W'' and tip T' of the calling plug. The sleeve circuit extends from S thru wire W', spring S S, resting contact 9, spring 2, resting contact 3, contact 10, spring C S and thru the wire W''' to the sleeve S' of the calling plug. The operator's circuit is shown by the diagram comprising the operator's telephone O P, transmitter S T, battery B, induction coil I, the springs X and contact 11; also the springs X S and X T thru which the operator's circuit is connected by means of the O P plug and the O C and O J springs thru which the operator's circuit is connected to the interconnecting circuit, that is, contacts 7 and 9. C O shows the clearing-out signal connected to the 7 and 9 contacts, R K shows a circuit-changing switch by means of which the repeating coil R may be cut into the circuit and thus separating the answering and calling plugs from direct connection with each other. Contacts G, G', G'' and G''' are connected one side common to the

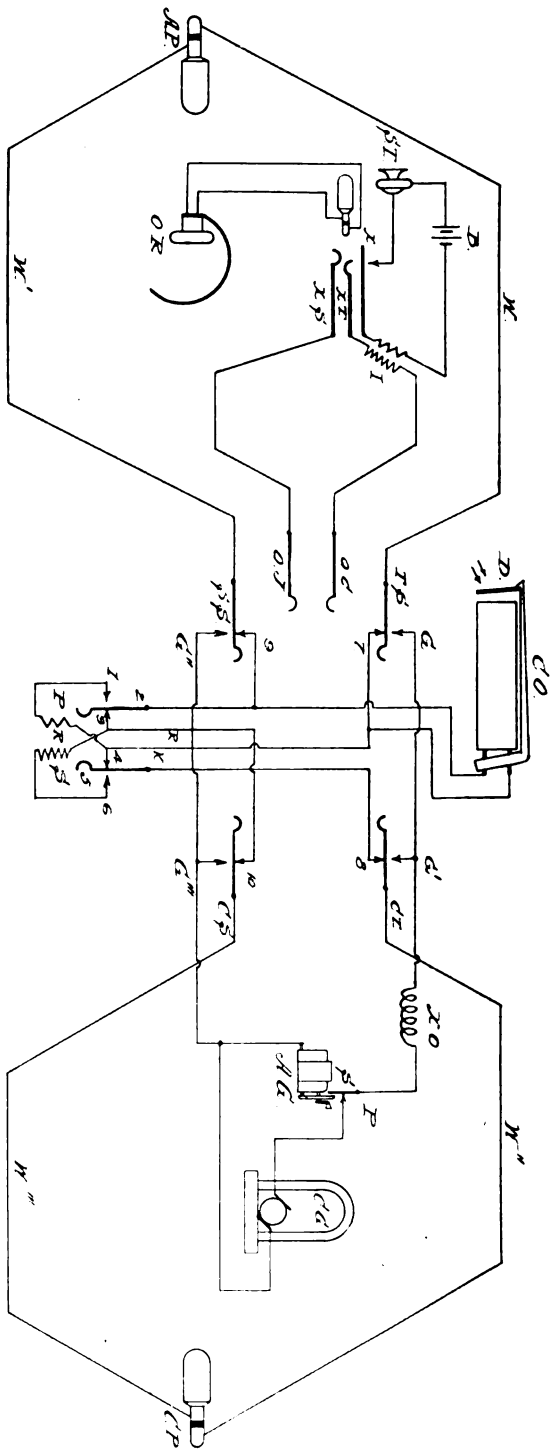


FIG. 5.

Digitized by Google

auxiliary generator A G and power generator C G. The upper contacts G and G′ connect to the spring of the selecting switch S, the resting contact P connecting thru the buzzer X O to the remaining side of the power generator C G.

In the lower portion of the diagram repeating coil R is shown, the P side of which connects to the 1 and 4 contacts while the S side connects to the 3 and 6 contacts. The normal condition of circuits of this system is shown in the figure. When the O P plug is removed from the X jack it cuts the operator's equipment clear from the O C and O J springs. At the same time the X spring is free from contact with the 11 point, which leaves the transmitter battery circuit open. With an operator on duty, however, the O P plug would be inserted into the X jack and upon receipt of a call the answering plug would be placed into the caller's line jack and connected across the cord circuit by manipulating the listening key so that the O C and O J springs make contact with 7 and 9 respectively. After learning the number of the subscriber desired the calling plug would be inserted into the called-for party's line jack and the key manipulated, so that the C T and C S springs make contact with the G′ and G″. Now then, if this contact be established and the C G generator in operation, a calling current will be projected over the circuit.

In case, however, that the C G generator was not in operation, the operator would have observed this by failing to hear the buzzer X O, which is included in the signaling circuit. The operator would then have driven the auxiliary generator A G, and, while doing so, automatically cause the generator to make contact with the S spring and breaking contact with the P spring, and thus projecting a signaling current thru the buzzer X O over the calling circuit.

After establishing the connection, if it is found necessary, a signaling current may be projected over the answering plug circuit by causing the springs T S and S S to make contact with G and G″, and further, if the caller had been a subscriber connected to a metallic circuit and the called party to a grounded circuit, and it appeared desirable to insert the repeating coil R, the repeating key R K would have been manipulated so that the spring 2 and 5 made contact with points 1 and 6, breaking contact with the points 3 and 4.

When this is done, it will be observed the calling-plug circuit is connected from contact 8 thru spring 5, contact 6, winding S, contact 3 and contact 10 to the spring C S, etc., while the answering plug is connected thru the spring T S, contact 7, contact 4, winding P, contact 1, spring 2, contact 9 and spring SS. Thus it will be observed that the calling and answering plugs are inductively connected with each other by means of a repeating coil in the well-known manner.

As stated before, Fig. 5 shows the usual way of connecting together the operator's set, signal-current generators and repeating coil equipment with the answering and calling plugs. It will also be observed that there are quite a number of resting contacts normally included in the circuit between the answering and calling plugs. In the most approved form of switchboards a great deal of attention has been given to the construction of a reliable form of circuit-changing switch, and in all such forms possessing reliable qualities, the resting contacts are made from platinum, and even the provision of platinum contacts does not always serve to maintain a continuity of the circuit between the answering and calling plugs, for it is one of the most difficult problems which the manufacturer has to contend with in building switchboards.

In the usual form of circuit-changing switches three distinct movements are provided for. This necessarily introduces a great deal of complication and calls for a high grade of mechanical ability in designing switching appliances. Thus, in Fig. 5 there are four normally resting contacts in the talking circuit, and in addition to this there are six normally open contacts which are required to be closed at the proper time. Now then, if any one of these contacts should fail to perform its intended functions it will, of course, result in an interruption of service. Such interruptions, while they may not be serious, always count

Digitized by Google

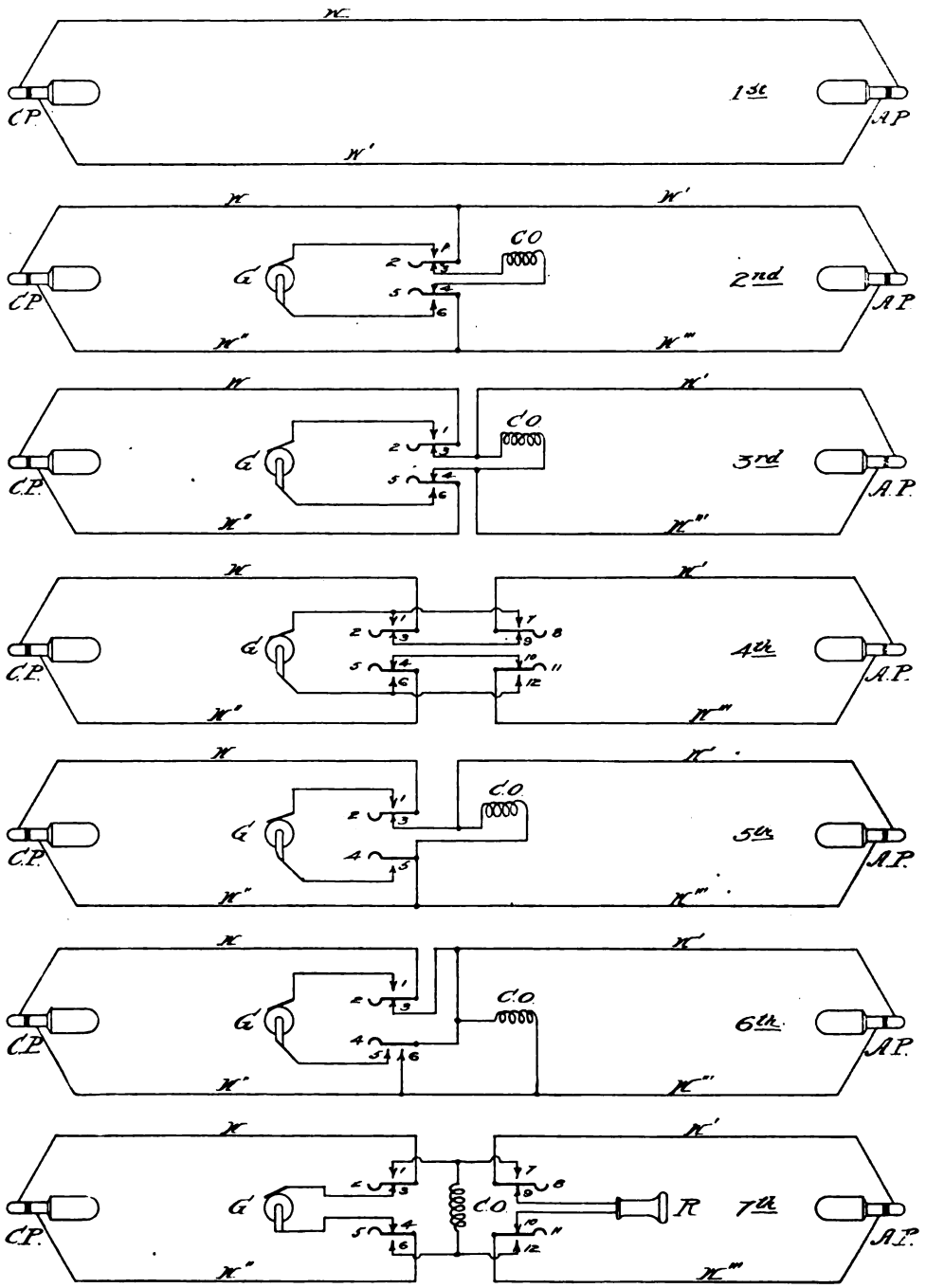



FIG. 6.

Digitized by Google

against a device of a given design. However, let us look at the matter from a practical standpoint. The first diagram in Fig. 6 shows that the plugs C P and A P connect together by means of the wires W and W'. Such a circuit, of course, represents the simplest possible way of connecting together two line jacks, but no provisions have been made for signaling. The second diagram shows the way in which the generator G is connected across the wires W by means of the springs 2 and 5 when pressed against the contacts 1 and 6. Normally, of course, the springs 2 and 5 rest in contact with points 3 and 4; thus when signaling out over the cord circuit the clearing-out C O is cut out of circuit. With this construction there is, of course, no break between the A and C plugs, as the operator's circuit might be bridged across the circuit in the usual way. But this circuit has the objectionable feature, as explained before, that an operator is not able to project a signal selectively over one or the other of the calling plugs. In order that this may be done the third diagram shows a way by which the C P plug is connected to the A P plug thru the springs and contacts respectively 2, 3 and 5, 4; the clearing-out circuit, also the operator's circuit, being bridged across the A P plug circuit. Thus, while signaling out over the C P circuit the operator cuts it clear from the A P circuit before connecting the signaling current generator to the 2 and 5 springs.

It is the writer's opinion that this system of circuits when applied to a circuit-changing equipment presents the most desirable features from both a practical and theoretical standpoint. In the first place there is absolutely no valid need for a circuit-changing equipment in which an operator is enabled to project a signaling current over the answering plug — that is, speaking of local exchange switchboards, for there is some reason for requiring a two-way ringing key for toll-line switchboards, as in such equipments it often occurs that the operator must signal out over either one of the connecting cords. In the local exchange switchboards, however, the saving of the two contacts as is shown by the third diagram and also by the fourth diagram is not to be underestimated, for practice has shown that a circuit-changing equipment having only two movements to perform can be made to operate in a much more reliable manner than one in which the three movements are required. As for the necessity of a back-ringing equipment in the circuit-changer there is no valid need, as the writer mentioned before, for when an operator receives a call for connection the A P plug is inserted in the line jack and the listening key manipulated. Now then, upon learning the party's number called for, the C P plug is placed into the called party's line jack, and the circuit-changing key thrown to the second position, which results in connecting the calling current generator to the C P plug circuit, and thus signaling the called-for subscriber's bell. Then, upon the key being restored to normal the caller and called party are in a position to communicate with each other. In case that the caller left the telephone before the called-for party responded, it is only doing justice to the remaining subscribers by withdrawing the calling plug as well as the answering plug, and reseating them. After the above plan has been tried the writer believes that many an exchange manager will decide to follow it whenever practicable, for it results in a much greater efficiency of service.

Many attempts have been made to still further reduce the number of resting contacts in a circuit-changing equipment, for it is here that the most danger of interruption lies, for in most cases "made" contacts are more reliable than the normally resting contacts.

Referring to the fifth diagram the C P plug is shown with the W wire connecting to the 2 spring and resting on the 3 spring, which then connects to the tip of the answering plug. The sleeve of the calling plug, it will be observed, connects clear thru to the answering plug and taps off to the spring 4 of the circuit-changer. The generator-circuit contacts are shown at 1 and 5, and the clearing-out coil is shown connected across the answering plug circuit.

With this form of an equipment and the signaling current projected over, the C P plug does not pass over the W'

Digitized by Google

circuit, but it does result in allowing the generator current passing thru the C circuit over the C P plug to divide and pass over the C circuit of the caller's line. This often results in producing a characteristic buzz in the waiting subscriber's receiver, which often is considered objectionable. Of course, it is probably out of the question to attempt using any arrangement of this kind on central-battery switchboards, but in the ordinary magneto exchanges it should prove acceptable in a great many cases where trouble is being had with the construction of a circuit-changing key already installed, for it is a simple matter to change the circuits by merely shunting out contacts, which will mean a considerable number. In case the above referred to buzzing sound in the calling or waiting party's receiver is considered objectionable, a circuit shown by the sixth diagram may be adopted and used to very good advantage. In this system it will be seen that the circuits are, in general, similar to that shown by the fifth diagram, with the difference that spring 4 is connected directly to the spring 3, and that the contact 5 has another contact placed alongside of it for the purpose of shunting out the A P plug circuit. Thus, while signaling out over the C P plug, the 2 spring is caused to make contact with the 1 point and the 4 spring with the 5 and 6 point. This shunts out the clearing-out drop and at the same time short-circuits the waiting party's line, which, of course, prevents any possible buzzing in the receiver.

The above diagrams have all been shown not equipped wth listening-in springs, but it is obviously possible to bridge them across the circuit wherever the clearing-out drop is connected.

The seventh diagram shows a system of circuits which would probably prove most successful if applied to a system of switchboards. Referring to the diagram, the plug C P is shown connected to the spring 2 and 5, and these springs then rest on contacts 3 and 4, which are connected to the signal-current generator G. Thus the generator is constantly left on the C P plug circuit. The A P plug is then connected to the springs 8 and 11 and rest on the contacts 9 and 10, which are connected to the operator's telephone equipment R. The clearing-out drop is connected to the wires connecting together the normally open contacts 1, 7 and 6, 12.

Now then, the operation of this equipment is as follows: An incoming call being observed, the operator picks up the A P plug and places it into the caller's line jack and learns his needs. Now it will be remembered that no manipulation of the circuit-changing key is necessary and the operator's set is already connected to the answering cord circuit. Upon ascertaining the number of the party called for, the C P plug is placed into the line jack and the signaling current projected over the circuit until the called party responds. Here, again, it should be remembered that no manipulation of the circuit-changing key is necessary. Now then, upon the operator perceiving that the called-for party responds, the first and only operation of the circuit-changing key is performed — that is, the key is thrown over into the thru connecting position. Thus we have but one operation of the circuit-changing key to be performed by an operator while connecting together the calling and called-for subscribers. Of course, when such an equipment is provided, it will be necessary to use automatic signals which would indicate the moment that a called-for subscriber responded, and also that either the caller or called-for party desired to have the connection dissolved. These matters can be and are being taken care of in many systems of switchboards where automatic signals are used.

(*To be continued.*)

## NEWS TELEPHONE.

In Budapest there is a news telephone, and its object is to keep its 6,000 subscribers supplied with all the latest news. The service has a main wire 168 miles in length, and it is connected with private houses and various public resorts. From 7:30 in the morning until 9:30 in the evening twenty-eight editions of news are spoken into the transmitter by ten men possessing loud, clear voices, working in shifts of two. The news is classified and given according to regular program, and the service is quite successful.

Digitized by Google

## TELEPHONE TRAIN DESPATCHING.

The use of telephones in train despatching in place of the telegraph is based on the fact that the telephone can be used under conditions where a telegraph instrument can not. The telephone gives an immediate reply and a positive O. K. that the orders have been properly received. The use of the telegraph requires the train despatcher to be a telegraph operator drawn from the ranks of operators and not from the ranks of railway engineers or road men. A message is sent by him thru his instrument usually in a code and transcribed by the operator into the written orders given to the trainmen.

The opportunity for mistakes begins with the first transcript of the message to be sent into the code, next with the sender of the message, next with the receiver and its transcript from the code to the written order and last to the reading of the order in semi-darkness or an uncertain light. This fourfold opportunity for mistakes has caused many accidents.

With the telephone the chances for mistaken orders are greatly reduced. The train despatcher can be a practical railroad man who knows every foot of the roadbed and tracks and understands every condition under which a train may be run, so that the train despatcher's office is likely to be able to cope with any emergency that might arise. His orders are received and given on the instant, with any verbal explanation required and any unusual conditions completely described.

The system by which the telephone is mostly employed is as follows: In the train despatcher's office there is one 'phone and a switchboard. At the point where his orders are sent there are two separate booths, each equipped with a 'phone. These 'phones are connected either in multiple or series as the case may be. The train arrives, the conductor enters one booth, the engineer the other. They now ring up and give their respective code signal. The train despatcher replies and gives the division orders. The conductor fills out a blank provided for the purpose and the engineer does likewise. The two sheets are now compared and the chance for mistake is eliminated.

Another system is as follows: At another receiving station there is a 'phone and a man in charge of it. Five minutes before train time the despatcher gives him instructions over the 'phone, which the receiver writes on his blank. When the train arrives the conductor rings up the despatcher on the same 'phone and receives his orders, which he writes on corresponding blanks. These two orders are compared and must be identical or else there is some mistake that is rectified by calling up the despatcher's office. In each case the despatcher is checked by sending or receiving two reports, which are written by him on corresponding blanks and which must tally to avoid mistake.

The wonderful improvement of the telephone over the telegraph in train service has been appreciated and adopted by prominent roads on an extensive scale. The first road to adopt the telephone for its system was the New York, New Haven & Hartford Railway, which early identified itself with electricity as applied to train service by its recognition of the possibilities of electric traction. This road utilizes the telephone for all its train despatching at the Boston Terminal and also for announcing the approach of trains. It has also leased a long-distance telephone line from New York to Boston over which it transacts most of its official business formerly transmitted by telegraph, with the advantage that communication is almost instantaneous and the work correspondingly increased and expedited.

The Illinois Central Railway also uses the telephone on all trains between Omaha and Council Bluffs, and so successful has the service proved that the entire system will be equipped with the telephone train service.

The Union Traction Company, of Chicago, has also adopted a system of telephones for despatching its suburban cars from junction to junction.

The time is not far off when the telephone will be adopted by all the leading railways of the world.

Digitized by Google

### THE TELEGRAPHONE.

A really wonderful product of telephonic development is the Telegraphone invented by the Danish engineer, Valdemar Poulsen. This invention is a phonograph which magnetically records the sounds converted into electric vibrations by the telephone, and appears to have solved a problem which has presented unusual difficulties. What the relay is to the telegraph, Poulsen's instrument promises to be to the telephone, and also to perform functions similar to those of the duplex telegraph.

The device has not yet crossed the water, but is now in use in some of the Danish telephone systems.

### AN ENGLISH DECISION.

British telephone subscribers are celebrating a legal victory over the National Telephone Company which seems to compel a corporation to furnish perfect service or be entitled to collect no toll. A stock exchange firm in London declined to pay for a "private wire" from their office to the Royal Exchange because the voices of young women operators at "central" could occasionally be detected over the line. The subscribers set up the claim that it was obviously, therefore, not a "private" wire. The telephone company's defense that the service furnished was as "private" as its facilities were able to supply was not sustained by the court, which held that the stock exchange firm was not liable under its contract.

### UNDERGROUND FRANCHISES.

The comparative ease with which franchises are obtained for the construction of telephone lines in American cities and the really few restrictions placed on their method of installation is shown by the action of the District Council of the Bristol (Eng.) Corporation. The National Telephone Company agreed to lay its wires underground in the Much Woolton district and submitted a draft agreement to the council covering the method of installation. This honorable body, impressed deeply with the rights of the public and their duty to their constituency, inserted several clauses in the agreement which the telephone company were unable to accept. It was then resolved that negotiations cease and that the clerk be instructed to ascertain from the Bristol Corporation the terms upon which the Telephone Company may be permitted to lay their conduits and cables under the roadways in their district.

American cities are only too glad to have underground telephone cables laid any old way, and it is safe to say that the average American city council would unhesitatingly accept any plan to lay wires underground which the telephone company might be bold enough to propose, and that their astonishment at the offer would probably preclude any attempt at criticism or suggestion as to any method of installation.

### ADVANCE IN SWITCHBOARD CONSTRUCTION.

In one of the largest exchanges in the world was shown, in recent tests, that connection between two parties was made in less than four seconds. Less than six years ago when the exchange switchboard consisted of three distinct parts: a switching board, a clearing-out board, and a signaling board; the time then occupied to connect two parties and make the call was a minute and a half. By the methods employed in switchboard practice today twenty-three calls can be made in that time. In no other department of telephony has there been greater advancement and it can be said as yet that telephony is still in its teens.

### 'PHONES FOR PHILIPPINES.

The United States have arranged to put in a telephone service in the Philippine archipelago. The Lambert-Schmidt Manufacturing Company, Weehawken, has been awarded a contract to supply $10,000 worth of telephone instruments and to ship them to Manila as soon as possible. To carry out this order quickly the company today put on one hundred extra men and ordered the employes to work from thirteen to fourteen hours daily with extra pay. The Government plan is to have the telephone service extended, not only thruout Luzon, but to connect Manila with as many other islands as possible.

Digitized by Google

# TALKS AND CROSS-TALKS.

BY A. E. DOBBS.

## HINTS TO CORRESPONDENTS.

Write on one side of the paper only, and make sketch or diagram, when necessary. Endeavor to give all the facts bearing on the case, so as to enable the editor to answer intelligently.

Name and address must accompany each letter, not for publication, but for the information of the publisher.

### A BATTERY QUESTION.

60. Please state the voltage and current for each of the following sets of batteries (Figs. 2, 3, 4, 5), giving the reasons for each case and assuming each cell to give 1.6 volts and .8 of an ampere. C. E. S.

The amount of current (.8 ampere) is very low for a cell giving 1.6 volts, as it would indicate an internal resistance of 2 ohms ($R = \frac{E}{C}$). Assuming that the voltage remains constant, we would have in Fig. 2 six cells in series, in

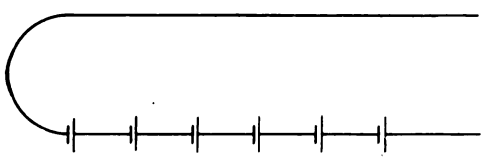


FIG. 2.

which case the voltage and amperes would all be added together, which equals $1.6 \times 6 = 9.6$ volts. But, as we have seen, we have 2 ohms' internal resistance in each cell, so that we could not say that $6 \times .8 = 4.8$ amperes, but that 12 ohms — the total resistance of the 6 cells at 2 ohms each — should be used as a divisor for the 9.6 volts ($C = \frac{E}{R}$), which would still be $\frac{9.6}{12} = .8$ of an ampere.

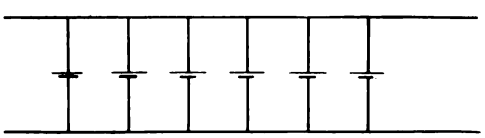


FIG. 3.

In Fig. 3 the conditions are reversed, as all the cells combined in this manner can not raise the voltage of the line, so that the pressure of all of them combined is only 1.6 volts. With the *current* output, however, the case is different, for all these cells add .8 of an ampere each to the line, so that we would have $6 \times .8 = 4.8$ amperes on a short circuit.

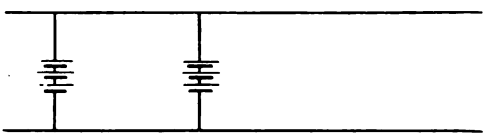


FIG. 4.

In Fig. 4 we have a combination of Figs. 2 and 3, as we have three cells in series giving a pressure of $1.6 \times 3 = 4.8$ volts in each series. Connected in multiple as they are, the pressure of the two sets combined can not rise above 4.8 volts. Each series of three cells adds, however, .8 ampere to the line, so that we have 1.6 amperes of current in the two sets.

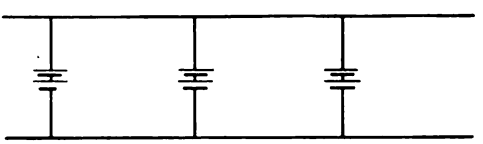


FIG. 5.

Fig. 5 is the same except that there are three sets of two cells each, giving 3.2 volts and 2.4 amperes to the line ($2 \times 1.6 = 3.2$ volts; $3 \times .8 = 2.4$ amperes). *With batteries in series, their volt pressures are all added together. In multiple, their current output is combined.*

### DRY BATTERIES.

61. Can you tell me anything about the use of dry batteries in telephone work? E. M.

In the use of dry batteries for telephone work, my own experience a cou-

Digitized by Google

ple of years ago made me very doubtful as to their practical utility, for they developed the most aggravating faults, such as running down on open circuit, uncertainty in action, etc. After that experience I advised all my friends to leave dry batteries off their lists of supplies. Some of my telephone friends, however, kept on experimenting in a small way with different makes of cells till they think they have found two or three that can be relied upon, and the results they have attained seem to justify their belief. In one case a manager told me he had placed some of them in railroad and other busy offices, where he got three times longer life for them than he did from any of the "wet" cells that he had. In justice, however, I might say that his wet cells were of a very inferior quality.

Some telephone manufacturers are so well satisfied with dry cells that they make boxes just large enough to take in two and no more, and in certain classes of instruments use no other kind.

It is not claimed that a dry cell is as good as a *good* wet cell, but that they are so much cheaper that it pays to buy them and throw them away when worn out. For example: Two dry cells can be purchased at a cost of 32 cents by buying them in quantities, or about half the cost of wet cells. One set of these batteries will last from six months to one year in ordinary use (some have a much longer record than that), when they can be thrown away and two more substituted.

(NOTE.—Do not take any stock in that old fairy tale about dry batteries being recharged, for, while they can be recharged, they are never reliable again and not worth the trouble.)

As to the expense of changing dry batteries, it really costs no more than the renewing of wet cells, for a man does not have to waste time cleaning them, renewing the zincs, or supplying sal ammoniac, to say nothing of annoying the people of the house while he is doing it.

As to efficiency, some short-circuiting and recuperative tests on dry batteries show up nearly as well as a good wet cell and better than the cheaper ones. A short circuit, of course, is not a fair test, as the resistance of the average transmitter circuit is hardly less than 40 ohms, which lacks a great deal of being a short circuit, but here is the result of tests on three different makes of dry cells:

No. 1.—Initial e.m.f., 1.63 volts.

On short circuit with ammeter.

| | | Recuperation after 30 min. | |
|---|---|---|---|
| Time. | Amperes. | Time. | Volts. |
| 0 min | 11.2 | 10 sec | .87 |
| 1 " | 7.5 | 30 " | .98 |
| 2 " | 6.3 | 1 min | 1.02 |
| 3 " | 5.5 | 3 " | 1.13 |
| 4 " | 4.9 | 5 " | 1.17 |
| 5 " | 4.4 | 10 " | 1.28 |
| 10 " | 3.05 | 30 " | 1.37 |
| 20 " | 1.87 | 45 " | 1.4 |
| 30 " | 1.4 | 60 " | 1.42 |

No. 2.—On short circuit. Initial e.m.f., 1.53.

| | | | Recuperation after 30 min. | |
|---|---|---|---|---|
| Time. | Volts. | Amperes. | Time. | Volts. |
| 1 min | 1.1 | 9 | 1 min | 1.06 |
| 3 " | 1.05 | 7.1 | 3 " | 1.1 |
| 5 " | 1.03 | 6.3 | 5 " | 1.12 |
| 30 " | .9 | 4.2 | 30 " | 1.17 |

No. 3.—Discharge for 60 minutes thru 5 ohms.

| | | Recuperation. | |
|---|---|---|---|
| Time. | Volts. | Time. | Volts. |
| 0 min | 1.35 | 0 min | 1.20 |
| 1 " | 1.31 | 1 " | 1.25 |
| 5 " | 1.3 | 5 " | 1.25 |
| 10 " | 1.3 | 10 " | 1.25 |
| 20 " | 1.26 | 20 " | 1.25 |
| 30 " | 1.25 | 30 " | 1.25 |
| 45 " | 1.21 | 45 " | 1.28 |
| 60 " | 1.20 | 60 " | 1.31 |

These tests were made on three different kinds of cells by three different persons in three different places, and show considerable uniformity in results, and, while they do not recuperate quite so quickly as some wet cells I have seen, yet they hold their voltage on short circuit as well as the best. Still I am not satisfied, and would like to hear from those of our readers who have used them in actual practice.

---

### A SUCCESSFUL EXPERIMENT.

In many parts of the country series ringers are still used on party lines, and there are occasions when they present advantages over the bridged ringer by their simplicity and the ease with which troubles can be located. Besides, with the bridged, grounded line, the ground

Digitized by Google

rod in the country is a very uncertain factor, for I know of places where a ⅝-inch rod driven 9 feet deep failed to give good service to that particular instrument. In view of this fact (please remember that grounded party lines are the subject of discussion), I have sometimes recommended the device shown in Fig. 6, and the following letter from a

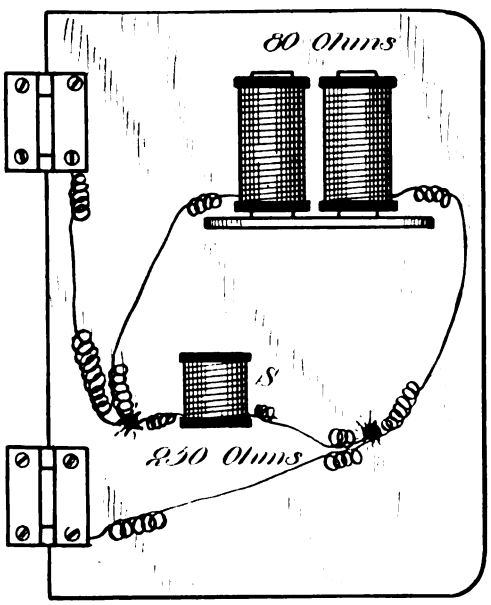



FIG. 6.

manufacturing telephone company, of Cleveland, Ohio, which was given in reply to inquiries on the subject, may give our readers an idea of how it works in practice.

Of course, twenty-seven 'phones on one line is not good practice, as the constant ringing and almost constant occupation of the line must be a nuisance, yet there are parts of the country where even this service is better than none at all, and there is no reason why the device mentioned should not overcome the objection to series lines and give a fairly good talking service.

TO THE TELEPHONE MAGAZINE:

In reply to your inquiry, would say that not long ago our firm received an order from a customer which called for twenty-seven series telephones, all to be placed on one line.

In reply to our letter advising him to use highly wound bridging bells, as we could not give good talking service thru so many ringers in series, he intimated quite plainly that he knew what he wanted, and we could either fill his order or let it alone.

Of course we agreed to fill his order if he would agree not to hold us responsible for results under the conditions named.

When the instruments were all set up and tested, he found, as we expected, that talking service was next to impossible, for you must remember that there were twenty-seven in series. By this time, however, we had made up our minds that these instruments *must be made to talk*, and proceeded to overcome the difficulty by means of a non-inductive shunt around the ringers as shown by the enclosed sketch (Fig. 6). We wound several coils on small wooden spools, rendering them non-inductive by doubling the wire back upon itself.

After a few experiments we settled upon a resistance of 250 ohms as being about right, and placed the shunt spools across the bell circuit at S (Fig. 6), so that the shunt as well as the ringers is cut out when the hook rises.

Our generators were of the ordinary series type, except that the armature was made to ring thru 50,000 ohms.

Our bells rang clear and strong, and the use of this simple device rendered ringing and talking satisfactory both to ourselves and our customer.

Since then we have received orders for several of these equipments from parties who preferred this arrangement to the use of bridged bells.

---

## CENTRAL BATTERY SYSTEMS.

In order to understand the effect obtained in the following described system let us first take a look at Fig. 8. In this figure there are two magnet spools *c c* in circuit which we will suppose

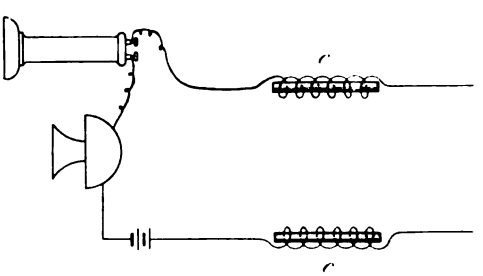



FIG. 8.

measure 100 ohms each, the real effect of which to telephonic currents is many times 200 ohms as long as the current passes in series thru the spools. If, how-

Digitized by Google

ever, we take an iron core, as in Fig. 9, and wind it with two coils as shown, then the effect is *nil*, as the self-induction

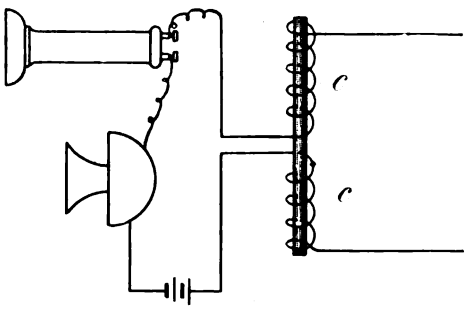



FIG. 9.

of one end of the spool balances that of the other and practically the only resistance in the circuit is its ohmic or measured resistance.

Suppose we have another form of neutral coil, as shown in Fig. 10, in which there is a coil placed in bridge or multiple across the line of, let us say, 500 ohms. While, as we have explained before, its telephonic resistance from line to line might be great enough to prevent all except a trifling loss of current, yet if we were to tap this coil in the middle and put a current into it from the ground or from a third wire, its resistance to this central tap would, on account of the neutralizing effects of the opposing coils, be only one-fourth of 500, or 125 ohms. This plan enables us to easily get two kinds of service out of one circuit in the system about to be described.

In Fig. 11 is shown a circuit which looks peculiar at first, and yet it will repay careful study not only on account of its peculiar character but on account of its peculiar action. Here we find the battery fed into the middle of the circuit, as in Fig. 10, and, using both lines as a single conductor, cross another bridge at

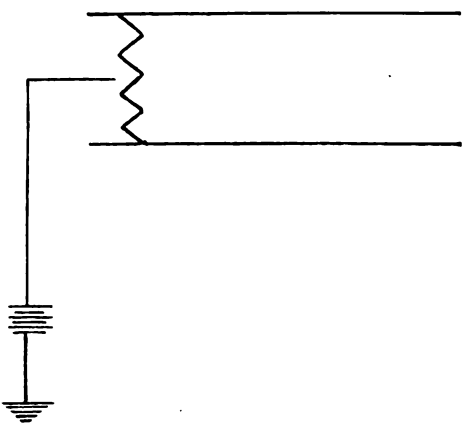


FIG. 10.

the subscriber's station and ground thru the transmitter at A and B, thus making a complete transmitter circuit thru the ground. But while both legs of the circuit are used as a single conductor for the primary circuit, or for supplying battery to the transmitter, the bridged coils R and *l l'* separate them, so that they are also a metallic circuit to the secondary

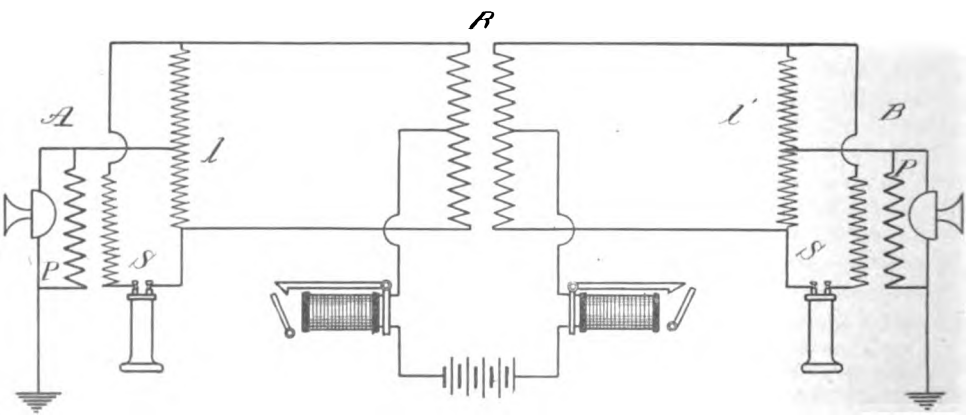



FIG. 11.

Digitized by Google

current of the induction coil, as the coils *l l'* separate the circuit enough to send most of the current from the secondary of the induction coil *s* thru the receivers and also allow it to complete the circuit thru the two sides of the repeating coil R. It is not a very simple circuit, yet it is not very hard to understand so far.

But, when we come to figure out this action as a primary circuit, we see an action differing from that of the ordinary transmitter and induction coil. In the ordinary primary circuit, variations in the transmitter produce like variations in the induction coil, a weak impression in the diaphragm producing a weak current directly in the primary coil.

In Fig. 11, however, we have a different result. Here we have the primary coil *shunted around* the transmitter instead of in series with it as in the ordinary case, so that a weak current in the transmitter allows of a stronger current in the primary coil, while a strong impulse in the transmitter gives a correspondingly weak one in the primary coil, as might be seen by a study of Fig. 14, in which the two currents are

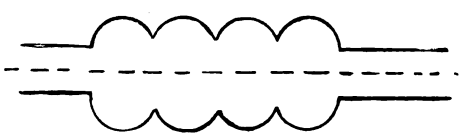


FIG. 14.

represented as waves flowing above and below a dotted neutral line. Thus when the transmitter current is low the primary coil current is high, and *vice versa*, so that the impulses that reach the line are really working backward much like a backstop relay. Of course the effect is much the same so far as conversation is concerned.

Fig. 6, in the October "Cross-Talks," also presents an action similar to this with this difference, that we must conceive of the current as being to a certain extent constant for the line, and a falling off of current in one transmitter allows of a corresponding rise of current in the other, which is no doubt assisted by the action of the condensers in the circuit; but, as these impulses have to travel over the line before they can become effective, it really seems as if the action of that circuit would be improved by the shunting of the primary coil, tho existing patents may prevent the use of that feature.

Now to return to Fig. 11. First, there is the battery *i*, in the circuit of which are the supervisory relays or lamps D D, connected to the center of the repeating coil R from which current flows over both legs of the circuit to A; thence thru the middle of the choke coil *l*, thru the transmitter and primary of an induction coil to earth. The choke coil *l* has high enough resistance to allow the secondary of the induction coil and receiver to pass around the outside and thus allow the use of the two lines as a metallic circuit. The other line receives current in the same way from the other side of the battery to the B station and earth, thus completing the primary circuit. It might be supposed that earthing the lines would be anything but a benefit to them, but by looking at the circuit again we will notice that tapping the choke coil *l* in the middle grounds both lines exactly

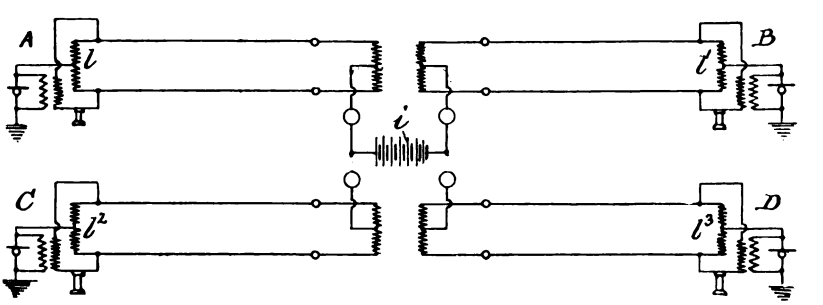



FIG. 12.

Digitized by Google

alike, and that as long as lines can be kept in balance, as to resistance, etc., the effect on both will be equal and therefore there will be no disturbance. It is also sometimes claimed that earthing the circuit in this way is a benefit in clearing the line of static charges. As nearly all of the independent central battery systems are more or less grounded in this way, it may account for the fact that they seem to be remarkably free from cross-talk. As the line ends at the repeating coil R in the cord circuit the differences of earth potential do not pass from one line to another.

Fig. 12 shows the same battery circuit connected to two or more lines.

Fig. 13 shows the circuits in detail, an analysis of which might prove of interest.

The first thing that we notice is, that the choke coils $f, f^1, f^2, f^3$ (called $ll'$ in Figs. 11 and 12) are in the cord circuit with the addition of condensers $k\,k'$, which may be inserted in case it is found desirable to send the battery to the transmitter over one wire instead of two. In the cord circuit are also included the supervisory relays or lamps $h\,h'$ which, as will be seen, remain closed only while the subscriber's receiver is off the hook, as the high resistance of the bell magnets would prevent any appreciable flow of current.

It will be noticed that one side of the circuit $a'$ is open in the jack, and that as the drops $d^2$ seem to be actuated by the removal of the receiver it would doubtless be necessary to add a ground and choke coil in the battery circuit at the point Z as indicated by the dotted lines, which, of course, is my own surmise.

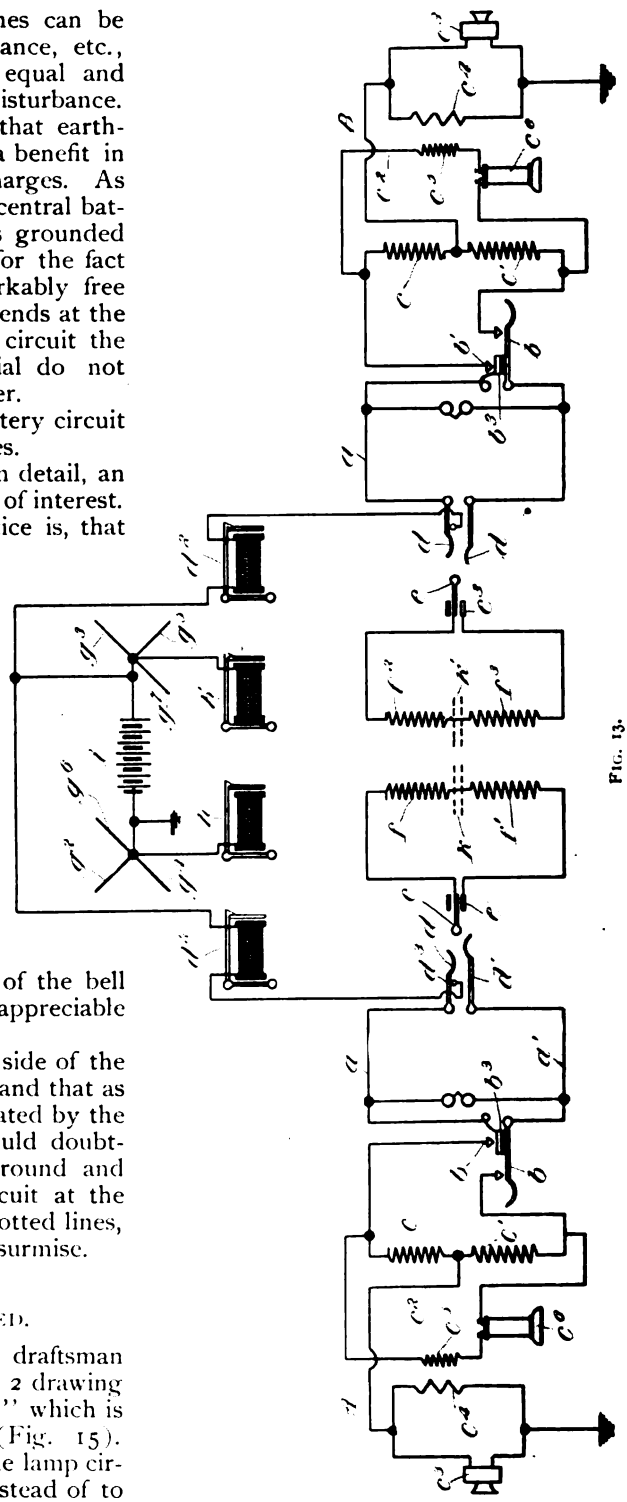


FIG. 13.

### AN ERROR CORRECTED.

Owing to a mistake of the draftsman there was an error in the Fig. 2 drawing of the October "Cross-Talks," which is here reproduced correctly (Fig. 15). The error lay in connecting the lamp circuit (L, L B) into the coil instead of to

Digitized by Google

the armatures or shutters of the relays in the cord circuit, which, of course, was a mistake. The entire sketch is here reproduced. It might be added that these relays should be of low resistance in order not to impede telephonic waves. These coils also act as impedance coils, which permit a flow of current to the line but also restrain telephonic vibrations from straying into other lines.

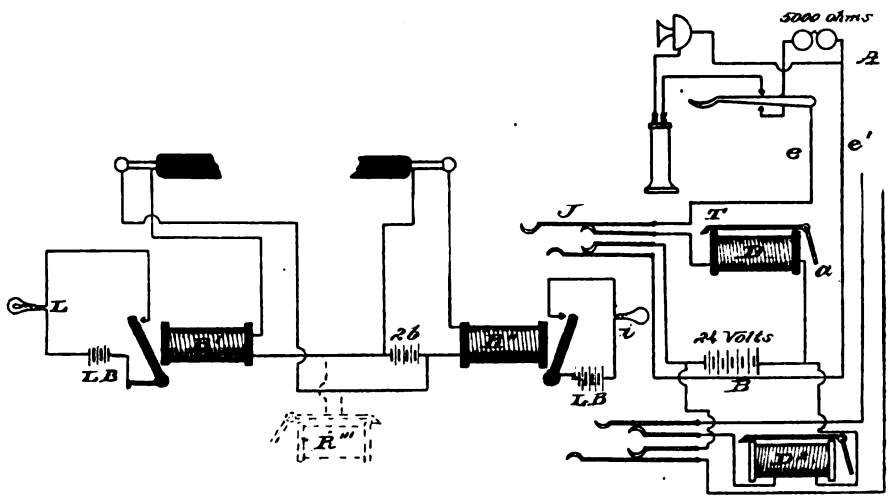



FIG. 15.

SOME INVENTORS.

The Inspector is not a pious man and sometimes says things, but is it not enough to cause a good man to be profane to find his ideas, even when not particularly brilliant or original, coolly appropriated by others and carried to the Patent Office?

In last year's story of the "Inspector and the Trouble Man," the October, 1899, issue of THE TELEPHONE MAGAZINE, in response to an inquiry, was shown a plan for running a telephone circuit along a trolley line, which consisted in simply tying two wires on a double-grooved insulator, and by changing grooves and sides make a complete revolution or transposition of the wires every fourth insulator, the sketch of which is reproduced in Fig. 1.

Six months after this publication, L. Hackethal, of Hanover, Germany, makes application for a patent on exactly the same idea, and as a few of the examiners in the Patent Office evidently do not read the technical journals, he has just been granted patent No. 657,104, described in the monthly Digest of Telephone Patents, page 146 of the October issue of THE TELEPHONE MAGAZINE — just one year after the original publication.

Now telephone linemen have tied two wires on one glass insulator, where space or convenience has been a consideration, ever since the double-grooved glass insulators have been on the market, and there is certainly nothing new in the "running transposition" which English linemen have used for the last fifteen years. But many of THE TELEPHONE MAGAZINE articles are reprinted in Germany as well as other European countries, and while Mr. Hackethal may not have seen the sketch in question, his patent drawing would lead to this suspicion, for he follows the sketch plan to

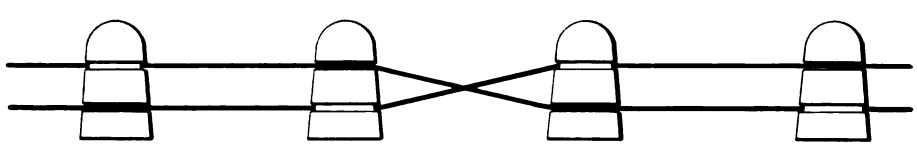


FIG. 1.

Digitized by Google

a dot and then returns it to this country as his invention. Hence this protest.

---

Once when the writer was in Chicago there came an inquiry asking for a central-battery plan for intercommunicating systems. The problem was not at all difficult and the Inspector sketched it out in a few minutes, made some minor corrections next day and published it in the December, 1898, issue, totally unaware that he had invented anything or that there was one single original idea in it, for there was not.

Yet the plan was copied by other papers and a few months later patented by some inventor in the East. A suit to maintain this patent would certainly stick the forehanded gentleman for the costs.

---

From March to May of this year we had a discussion of the static charge on lines caused by dry wind and snow storms, and in the May number Mr. G. M. Dwelle sent in a diagram which showed a bridging bell tapped and grounded in between the coils. (See Fig. 1 in May, 1900, number, "Talks and Cross-talks.") As Mr. Dwelle had used this device several months previously, he was probably entitled to a patent if any one was, altho neutral coils have been used for many years, but last month we find it issued to another party altogether, and as the Patent Office is about five months behind, it is therefore evident that he must have filed his application about the time the May number of this magazine was issued.

---

The Inspector has had the confidence of quite a number of inventors and he ventures to offer the following advice:

First. Find out if the invention you propose is practical or practicable, for an invention may be the one without the other. Thus, writing telegraph machines are practical, but coming after the telephone they are not practicable, as no one cares to use them. Therefore, as the prime object of inventors is to make money from their patents, there is not much to be gained from an idea that is not a money-maker.

Second. Get a list of similar patents from some public library and send 10 cents to the Patent Office for each copy desired. You may find your idea already covered or partly covered by patents, or you may learn that the idea has proved a failure. New inventions are extremely scarce, for even that wonderful genius Edison has so far only developed about half a dozen absolutely new inventions, which is fully three times as many as any one else.

Third. About this time make a sketch of your device and get some friend whom you can trust to put his signature to it as well as the date. This may be useful in settling questions of priority.

Fourth. Now, if possible, make a trial of your invention; as a device which looks all right on paper may develop some unexpected defects when put to actual use.

Fifth. You are now ready to make application for your patent, and if your attorney knows his business you are in a position to get one that will protect you from infringement.

---

### A SIMPLE METHOD OF TESTING OUT DESK-SET CIRCUITS.

It sometimes happens that the wires in the cord leading from a desk set get mixed up and the tags lost, and it is very convenient to be able to find them again, especially as it is not easy, as in the case of a wall set, to trace the circuits. In the above case proceed as follows, on the supposition that the cord has been entirely disconnected from its strip:

In Fig. 7 it will be noticed that the primary circuit is connected to posts 1 and 3, while the receiver is looped in on posts 3 and 4.

First take a battery and try various combinations of the free ends till you get hold of two in which tapping of the transmitter will be also heard in the receiver with the receiver off the hook.

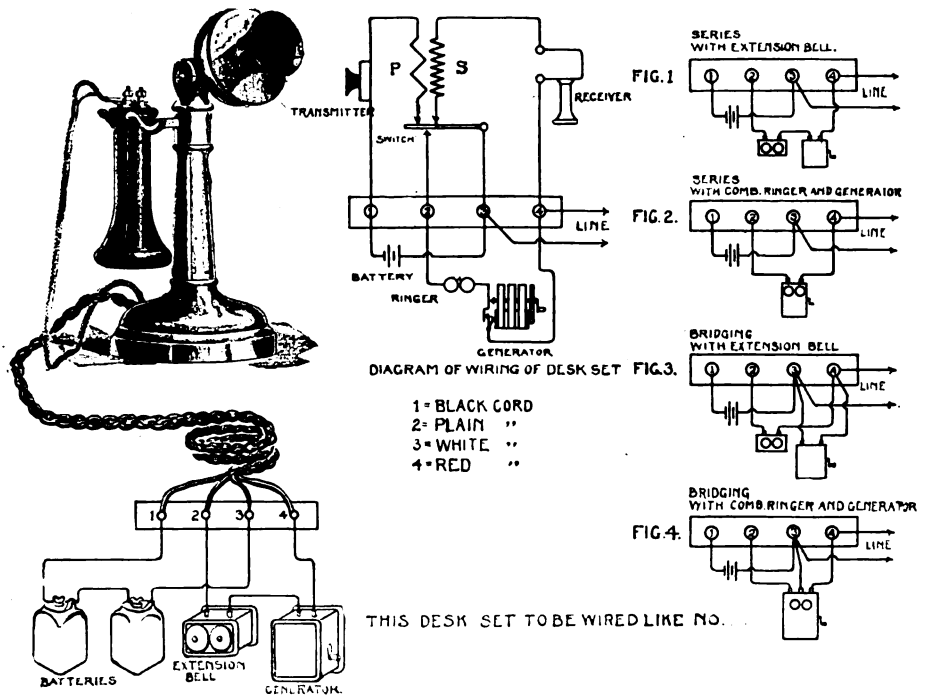
This will indicate that these two wires belong to posts 1 and 4, but of course you can not tell, as yet, which is which. Now, with the hook still up, try first one and then the other of these two until you get an unmistakable circuit thru the receiver, which is a sure indication that

Digitized by Google

the two wires you now have are 3 and 4, while the other one of the first two you found must be No. 1. In order to test this, you may now connect them to strips 1, 3 and 4 as indicated, and connect the battery as per diagram, which should indicate whether the line will give talking service. If this proves all right, you have only one wire left, which can not be anything else than No. 2.

ground cable is increased in about the same proportion when we pass from copper to aluminum.

"Aluminum is not a pleasant metal to deal with, but its high conductivity will make it invaluable for overhead transmission. It is true also that the weight to be supported on posts is half of copper, but the surface exposed to the wind is greater, and its strength is not great.




The four diagrams given show the different methods of connecting in series and bridging or extension bells. When extension bells are used, do not loop them into the main line but into the local circuit, as shown, in order that they may be cut out when the hook comes up.

## PROTECTING ALUMINUM CONDUCTORS.

Lord Kelvin, in a recent paper on "Distant Electric Power Transmission," says of aluminum conductors:

"The weight of aluminum required is almost exactly one-half of the copper which would produce the same effect. The diameter of cable is twenty-eight per cent in excess of one made of copper, and the cost of insulation for an underground cable is increased in about the same proportion when we pass from copper to aluminum.

"Aluminum is not a pleasant metal to deal with, but its high conductivity will make it invaluable for overhead transmission. It is true also that the weight to be supported on posts is half of copper, but the surface exposed to the wind is greater, and its strength is not great. The chief drawback to its use, especially overhead, is its liability to become rotten. This defect does not exist if the metal be pure, and especially if free from sodium. But exposure to the atmosphere, especially near the sea, induces deterioration. The fact that aluminum is easily oxidized ought not to condemn it. The same is true of iron and steel, and yet we do not hesitate to place structures of these metals in exposed positions. Only we paint them; so I suppose that we paint or varnish our aluminum conductors wherever necessary. We have had little experience in this direction. I laid out a few hundred yards of ¼-inch aluminum wire on a Scotch estate a year ago, and am watching the effects of weather."

Digitized by Google

# Telephone Magazine

THE ONLY INDEPENDENT TELEPHONE PAPER IN THE WORLD.

MARQUETTE BUILDING,

TEL. CENTRAL 2541. CHICAGO.

Published on the 15th day of each month.

**Electrical Engineering Publishing Co.**

JOHN C. McMYNN, PRESIDENT.

**SUBSCRIPTION:**

One year, United States and Canada..... $1.00
One year, foreign countries..... 1.50
Single copies..... .10



**COPYRIGHT:**

The title and contents of this paper are covered by a general copyright. Permission from publishers must be obtained before any article or table is copied, or any illustration reproduced.


**CHICAGO, NOVEMBER 15, 1900.**

BEGINNING with this month's issue, we publish under the head of "Telephone News," condensed information from the entire telephone world. This consists of all the news from the Independent field, and such matters pertaining to the Bell interests as may be of value. This has heretofore been attempted in part by many electrical journals, but no one publication has covered the field. These items will not only be of some interest to our readers, but will prove a valuable aid to the manufacturers and dealers who wish to increase their mailing lists with new and bona fide names. This information, coming to us as it does, lacks the usual staleness, and may be relied upon as authentic.

FROM the same sources of information from which the "Telephone News" items are gathered, will appear timely articles too valuable to be condensed and which represent the latest information regarding the many new devices as they appear, and which give the important facts in the development of the telephone business.

NEVER before has there been such interest taken in the development of any branch of the art as there appears to be in wireless telephony. As most of the experimenting in this field has been done abroad, we have made arrangements to secure the latest reports of the progress on this new and interesting subject. We will publish the result of the experiments of such men as Lodge, Marconi, Preece, Leeds and Tesla, and will hope that they will prove as interesting to our readers as we believe they will.

A PERSON need not be very old to appreciate the difference which modern facilities and conveniences have made in the means of collecting and disseminating information regarding elections. The telegraph, the telephone and the voting machines have revolutionized that business. Americans are proverbially in a hurry and are more anxious about nothing than about the result of a presidential election. It is not so very many years ago that even the most enterprising newspapers could not give the result accurately or certainly for two or three days. Not more than twenty years ago it was impossible to hear from every election district in time to publish the figures in the next morning's paper. Nowadays that is all changed. The telephone companies, thru exchanges, bring to their offices in this city and send to the press the complete returns from every town very promptly. The newspaper offices with their own wires are able to get the figures from the States within a few minutes after the count is completed, and the morning newspapers are enabled to give an accurate report.

Digitized by Google

## LIST OF THE COMPANIES CONTROLLED BY THE BELL.

Having received a large number of inquiries as to what companies are operated by the Bell, we herewith give the list:

American Telephone & Telegraph.
Bell Telephone, of Buffalo.
Bell Telephone, of Missouri.
Bell Telephone, of Philadelphia.
Delaware and Atlantic Telephone & Telegraph.
Central District and Printing Telegraph Company, of Pittsburg.
Central Pennsylvania Telephone and Supply.
Central Union Telephone (Ind., etc.).
Chesapeake and Potomac Telephone.
Chicago Telephone.
City and Suburban Telegraph Association (Cincinnati).
Colorado Telephone.
Cumberland Telephone & Telegraph.
Ohio Valley Telephone.
Duluth Telephone (entirely owned).
Hudson River Telephone.
Iowa Telephone.
Missouri and Kansas Telephone.
New England Telephone & Telegraph.
South Massachusetts Telephone.
Nebraska Telephone.
New York Telephone (New York City).
New York and New Jersey Telephone.
Westchester Telephone.
New York and Pennsylvania Telephone & Telegraph.
Pacific Telephone & Telegraph.
Sunset Telephone & Telegraph.
Oregon Telephone & Telegraph.
Inland Telephone & Telegraph (Washington).
Pennsylvania Telephone.
Rocky Mountain Bell Telephone.
*Southern Bell Telephone & Telegraph.*
Western Electric (manufacturing).
Bell Telephone of Canada.
Central New York Telephone & Telegraph.
East Tennessee Telephone.
Empire State Telephone & Telegraph.
Erie Telegraph & Telephone.
Cleveland Telephone.
Northwestern Telegraph Exchange.
Southwestern Telegraph & Telephone.
Michigan Telephone.
Wisconsin Telephone.
Freeport Telephone Exchange.
Miami Telephone Exchange.
Northern New York Telephone.
Plymouth (N. H.) and Compton.
Troy Telephone & Telegraph.
Southern New England Telephone.
Providence Telephone.

The many smaller companies are operated thru some one of those listed.

---

USE our want ads. and fill that long-felt want."

## THE MEGO TELEPHONE.

Some very remarkable experiments, which seemed destined to signalize the beginning of a new era in telephony, were recently conducted in Paris.

About a hundred guests, assembled in the garden of the official residence of the Under-Secretary of State for Posts and Telegraphs, were enabled to hear songs and speeches transmitted by telephone from a room 150 yards away, the voices being reproduced without any perceptible loss of volume. This result was obtained with a telephone invented by M. Germain, an official of the department.

This invention is considered likely to effect such a revolution in telephone communication that the French authorities have ordered an exhaustive trial of the new instrument, with a view to its general adoption. The new system possesses such manifest advantages for long-distance communications that its general adoption can only be a matter of time.

Theoretically, the use of powerful currents should make it possible to establish telephone communication between Europe and America, but the difficulty and expense attendant on laying a suitable cable stand in the way. M. Germain, however, by no means despairs of overcoming the obstacle. His microphone has already given birth to a "micro-transmitter" which acts as a loud-speaking telephone over 2,500 miles.

Early in 1899 some experiments were made with the Germain telephone on an artificial circuit having the same resistance (1,600 ohms) as the telephone line between London and Paris. With the small desk-receiver the voice was clearly audible in every part of a large room. With a tubular receiver eight feet long, passing thru the wall of the house, the voice was distinctly audible fifteen yards from the mouth of the receiver in the open air.

After so severe a test as this, experts say there is nothing incredible in M. Germain's claim to be able to transmit sound of any kind, and reproduce it 250 miles away before an audience of 2,000 people assembled in any hall of first-class acoustic properties.

Digitized by Google

The possibilities of this telephone development seem practically inexhaustible. One of the most striking applications of the Germain telephone is in connection with the phonograph and the cinematograph or biograph.

As every one knows, the phonograph can not register sounds not produced in close proximity to the receiver, and especially directed into it. If we desire to record the actual stage delivery of a famous actor, for instance, the phonograph gives us no help.

The loud-speaking telephone here steps in and supplies the missing link. A large metal frame containing a considerable number of sound magnifiers — thirty-six are required for the Paris Opera House — is suspended near the stage. In an adjoining room is the receiver, placed immediately above the phonograph, to which the telephone conveys every sound from the auditorium. By a combination of the three instruments it is thus practicable to record and reproduce a scene, with the actor's every word and gesture.

Sir Henry Irving and other public favorites will live and move and have their being long after they themselves have gone the way of all flesh.

Before long a biograph theater, with the best actors and vocalists of the day at its command, will doubtless form an indispensable part of every well-regulated ocean liner.

In combination with the phonograph, the loud-speaking telephone is destined to be of great service in recording the debates of public assemblies. These two instruments will turn out a verbatim report, the accuracy of which can not be disputed.

If we go a step further and cause the telephone to dictate to an expert operator on a typesetting machine, we shall produce a verbatim report without a reporter having to write a line.

JEAN VURAND.

---

I COULD not do without your magazine in my exchange as it not only furnishes me with all the telephone news but instructs me as well on all the new and up-to-date points.

J. C. S.

## DRY VERSUS "WET" BATTERIES.

BY P. P. NUNGESSER.

The writer has read with considerable interest the various arguments pro and con regarding the use of dry batteries for telephone exchange service. Undoubtedly, many telephone managers have had unsatisfactory results with the use of dry batteries which they have personally tested. Such men, of course, are hard to convince, as their own experience tends to make them prejudiced, but there are differences in batteries as in every other marketable commodity.

While of late years very little progress has been made in the improvement of sal ammoniac cells, very decided improvements have been made in the construction of dry cells, and, without any disparagement of other makers, I will offer no apology for referring to the product of the firm I represent.

Having been interested in the manufacture of both dry and liquid batteries for the past twelve years, we are therefore in a position to estimate the relative value of both for telephone service, and from actual experience do not hesitate to say that where a dry battery is constructed expressly for telephone work, its output and durability can not be equaled by any liquid sal ammoniac battery, while the cost is very much less.

For example, our 1900 dry battery, in the test of actual work, has probably shown the longest exchange service of any cell yet produced, due to the fact that it is manufactured especially with a view to transmitter service alone. Our confidence in these batteries is so great that we do not hesitate to guarantee them, when used in connection with transmitters having a resistance of from 30 to 35 ohms, to give eighteen months of ordinary exchange service without attention or recharge of any kind, while, with high-resistance transmitters (60 to 75 ohms), we have records of over three years' continuous service without attention or renewal. Of course, in speaking of ordinary service, we do not mean the busiest lines, for a battery used one hundred times a day could not be expected to last as long as one used only ten times a day; but, even in the first

Digitized by Google

case, a good dry battery will outlast any other kind.

Now, a word as to recharging, which excites a smile of incredulity from some of our friends. Recharging cells has been tried and accomplished too often to admit of any dispute, in regard to our own product at least. In order to be not misunderstood, I will say that recharging is only practicable where the failure of the electrolyte is caused by the depolarizing mixture surrounding the carbon, becoming saturated with the zinc solution, till there is no longer a free chemical action. If this be the case, a current passed thru the cell, from the carbon to the zinc, will dissolve and precipitate this zinc solution and restore the cell to almost its original condition. I say almost, for, owing perhaps to a slight drying out of the solution, it will have only about seventy-five per cent of its former life. Another practice sometimes resorted to in exchanges, when a battery has become leaky thru dissolution of the zinc, is to set it into a jar of water and sal ammoniac, and get a still longer service from it till the zinc is exhausted.

In recharging this battery, the positive wire of the charging circuit is connected to the carbon or positive pole of the battery. The negative wire of the charging circuit is connected to the negative or zinc pole of the battery. Whatever the voltage of the charging circuit may be, a lamp of corresponding resistance must be connected in series with the batteries. In charging on a 110 or 220 or 500-volt circuit, the battery can be allowed to remain in the charging circuit provided the charging current does not exceed three-fourths of an ampere, as otherwise the heating effect might be injurious to the cell.

The internal resistance of the battery being low, 100 of them in series would probably not exceed 20 ohms.

Again I wish to call attention to the fact that a short-circuit test on a new cell does not indicate the conditions of telephone service, as both dry and wet cells may show a high amperage while new, and yet fail utterly on a long-time test. A battery having so much local action that it will deteriorate when standing on a shelf is of no use in telephone work. Cells that stand for thirty days and are given a final voltmeter test before using that does not show 1.55 volts should not be put into service.

## TELEPHONE IN BERLIN FIRE SERVICE.

Berlin, Germany, has fifteen fire stations, each of which is connected by underground circuits to a large number of fire-alarm boxes. To obtain the advantage of communication between the nearest station and any alarm box during the progress of a fire, a specially made 'phone has been introduced.

A microphone, fitted with a battery switch and a second receiver, are suspended from a frame attached to the Morse apparatus at the station. The balance of the apparatus consists of an induction coil, a condenser and a circuit key. Instead of having a 'phone at each alarm box, a portable set is used which is attached to the fire alarm post or box with a plug and socket. Each of the eighty fire carts carries these portable sets, the bicycle brigade carrying a smaller set of compact design.

The simultaneous telegraphing and telephoning does not spoil the audibility of the 'phone, tho there is a considerable vibratory and ticking effect produced.

## INSULATION BY ICE.

A patent has been granted Nicola Tessla wherein he claims the use of ice as an insulator for electrical conductors.

Two methods of applying his idea have been tried — one a hollow conductor immersed in water with a cooling agent inside the hollow conductor which freezes a protecting coat of ice on the outer surface of the conductor. The other is a solid conductor laid in water and a separate channel provided for the freezing mixture.

It would seem from Mr. Tessla's demonstrations that a telephone line the wires of which are sagged together from the weight of sleet and then frozen, are thoroly insulated from each other, and that any cross-talk from a line in this condition is produced only when the bare lines, that may not be fully covered by ice, touch each other.

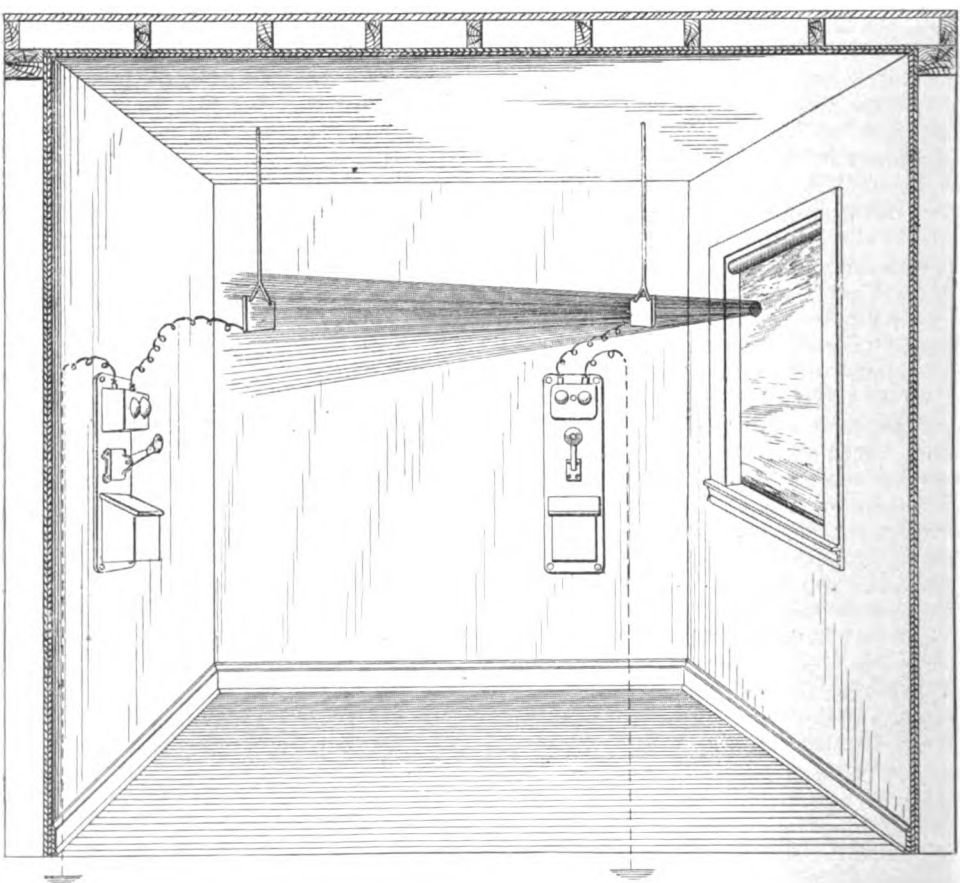
Digitized by Google

## TELEPHONING OVER A RAY OF LIGHT.

To demonstrate the possibilities of wireless telephony, a simple experiment, and an interesting one, may be carried out by any one having the 'phones at hand.

The first thing required is a room that can be shut up so that no light will be admitted save the ray of light used in the experiment. After the room has been darkened, cut a small hole in the window shade so as to admit a single ray of light that will not become diffused until it has crossed the room. Now, secure two copper plates about four inches square, connect a wire on each one of these plates, and run that wire from one plate to one side of one telephone. Connect the other plate to one side of the other 'phone in the same manner. Now ground the other side of each 'phone and hang the two copper plates in the rays of light. It makes no difference how far apart the plates hang as long as they both cut the ray of light. Of course, the plate nearest the window must hang only partly in the light so as to permit half the rays to reach the other plate, as shown in the cut.

If these directions are followed you will be able to ring and talk without any connection other than described, provided the instruments are capable of both talking and ringing thru 20,000 ohms' resistance.



Digitized by Google

# MONTHLY DIGEST OF TELEPHONE AND KINDRED PATENTS

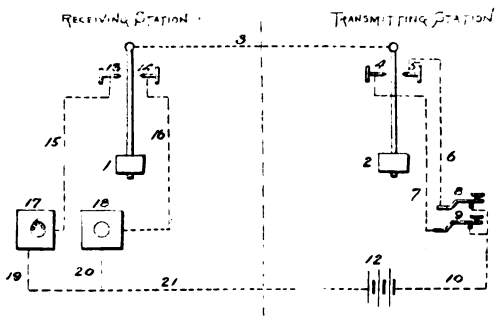
EDITED BY EDWARD E. CLEMENT.

Copies may be had, postage paid, by enclosing 10 cents for each one. Address inquiries in care of this magazine or to McGill building, Washington, D. C.

*October 9.*

No. 659,269.—B. WALLER. ANNUNCIATOR FOR TELEPHONE EXCHANGES.

This is a system of signaling whereby a number of annunciators may be controlled thru a signal wire. It depends

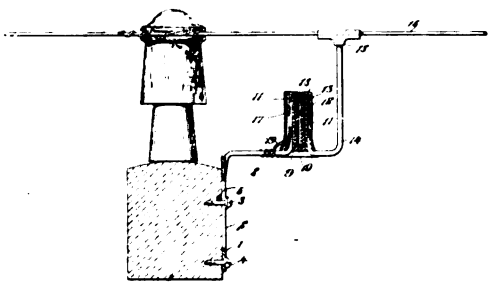



659,269. ANNUNCIATOR FOR TELEPHONE EXCHANGES.

for its operation upon the principle of synchronism of moving parts at different stations. In the forms described two moving parts vibrate or rotate so as to touch corresponding contacts at the same instants of time, and different annunciators and their corresponding keys are connected to these contacts. Thus in the figure given herewith, 1 and 2 are vibrating arms synchronously touching the contacts 13-4 and 14-5. When key 8 is depressed, current from battery 12 will pass to arm 2, by contact 5, to line 3, arm 1, contact 14 (that being always in circuit when the contact 5 is) and so to annunciator 18 and back to battery. A form of annunciator is employed that requires a longer period for its return to a position of rest than the interval between the impulses it receives. It thus remains displayed continuously, altho the current is intermittent.

No. 659,559.—C. M. TAYLOR. LIGHTNING ARRESTER.

Overhead telegraph and telephone lines often give trouble by reason of atmospheric discharges, and to avoid this trouble and keep the lines discharged it has been found necessary to arrange spark gaps or grounded discharge terminals at intervals on the cross-arms. The



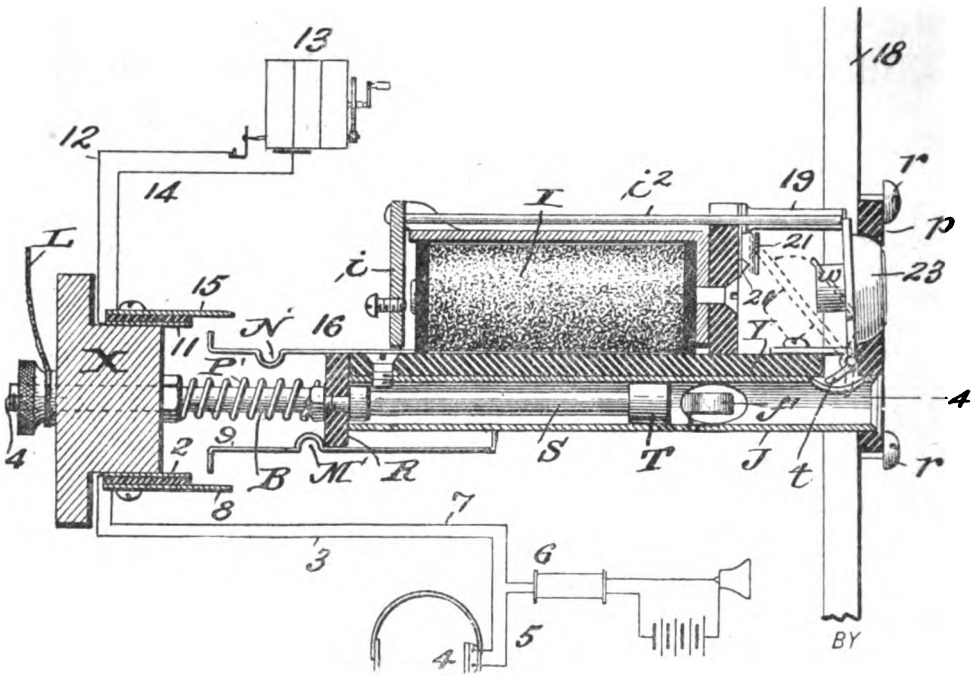
659,559. LIGHTNING ARRESTER.

present device belongs to this class of "arresters." The line wire 16 is clamped by a jaw 15 on the wire 14, whose lower end carries a metal plate 13 with a carbon face 12. A similar carbon face 10 is carried on a metal 9 carried by wire 8, which is itself carried by bar 2 connected to the ground wire 6. The carbon faces 10 and 12 are spaced a little apart by asbestos or other insulating material 11—and are secured in place by ring 17 of insulating material. A cover or casing 18 is held down over the whole by wire 19 secured to the wire 8.

No. 659,588.—C. T. MASON. TELEPHONE SWITCHBOARD ANNUNCIATOR AND JACK.

This is a combined jack and annunciator, the latter being of the "mechanically self-restoring" type. The drop 23 has a weight *w*, and is pivoted at its lower edge, so that when armature *i* is attracted by magnet I, and the support $i^2$ thereby withdrawn, the drop will fall inward, and a tongue *t*, at its lower edge, will be thrown down into the jack in the path of an entering plug, which, by pushing it backward and upward will restore the drop to the full line position. The drop in falling presses together night bell contacts 20-21, which have spring extensions, not shown, pressing

Digitized by Google




659,588. TELEPHONE SWITCHBOARD ANNUNCIATOR AND JACK.

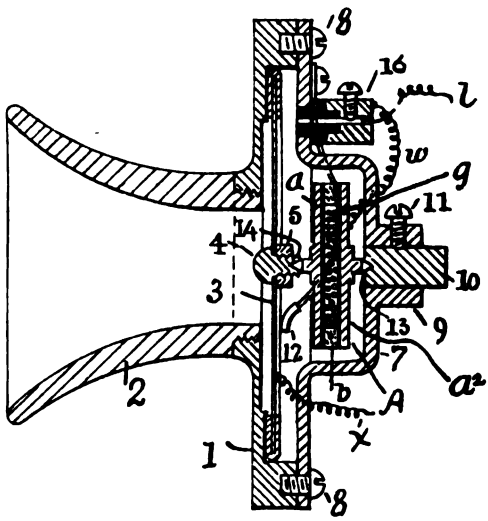
against the vertical supporting rods 18 of the framework of the board. These are of metal, and are alternately and oppositely connected to the night bell and battery bus wires, so that bridging any two adjacent rods closes the bell circuit.

On the rear of the framework are horizontal strips 2, 8 and 11, 15, connected to the operator's set, and the ringing generator, respectively. A plunger T is arranged in the jack tube so that it may be pushed against the retractile force of springs P' by the plug. Springs 9 and 16 in pairs are connected to the line terminals, and have shoulders M' and N' in the path of crosshead R on the plunger T, but are at different distances from it. Thus, pushing the plug in part way throws down springs 9 against contacts 2, 8, and the operator is connected. Pushing it in the rest of the way disconnects the operator and pushes up springs 16 to connect the generator.

*October 16.*

No. 659,691.—G. B. PERKINS. TELEPHONE TRANSMITTER.

This is a transmitter of the bridge type. A front plate 1 carries the bridge 7, and a diaphragm 3; and between the bridge and diaphragm is placed the resistance-varying button A. This consists of a front plate *a* and rear plate $a^2$, both faced with carbon and having




659,691. TELEPHONE TRANSMITTER.

pointed spindles. The disks are placed face to face, and a felt ring or annulus *b* is cemented to both. The granules are

Digitized by Google

confined between the carbon-faced disks and within the ring. The diaphragm is edged with a rubber gasket, and has a central bearing screw, 14. One spindle of the resistance button *a* rests in this, and the other in a seat in the adjustable bearing block 10 of bus 9. Circuit is by wire X to diaphragm, thru button A, and out by the frame.

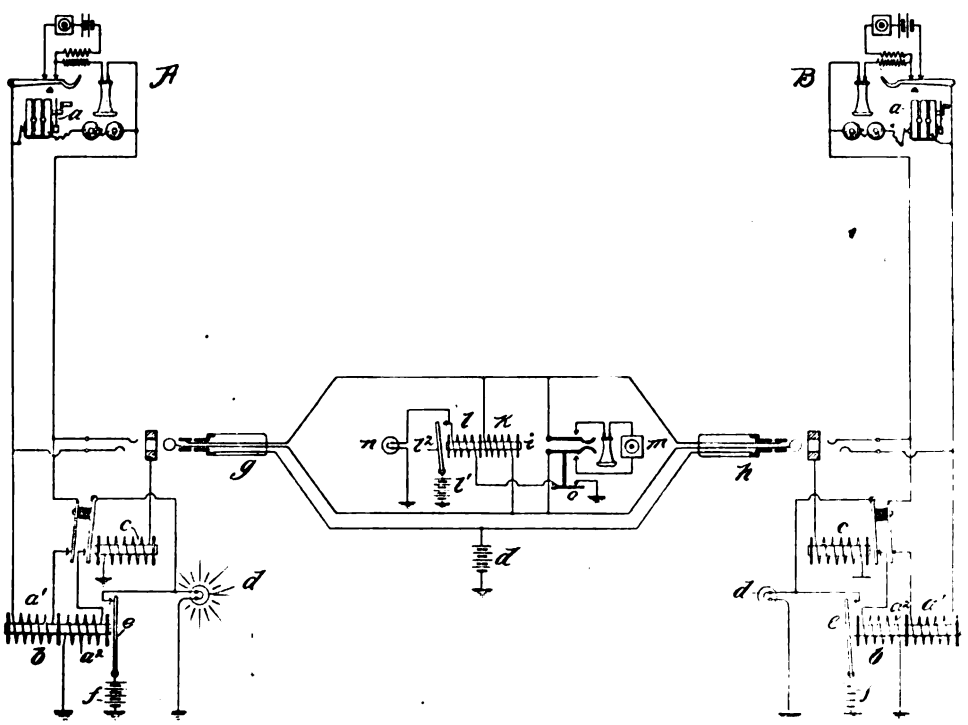
No. 659,759.—J. L. McQUARRIE. TELEPHONE EXCHANGE SYSTEM.

This is a system having relays and lamp signals at central, but magneto generators at the subscribers' stations. Each signal relay has two windings, one in the line and one in parallel with its lamp in local circuit. When subscriber A rings, relay *b* attracts its armature to close circuit from battery *f* thru both lamp *d* and extra winding $a^2$, thus holding the armature *e* up. When plug *g* is inserted, cut-off relay *c* is energized, and circuit of winding $a^2$ is broken.

The clearing-out annunciator *k l* is arranged on the same principles. One winding *k* is bridged across the cord circuit. The other is in a local circuit with battery *l'* in parallel with lamp *n*. When operator's key *o* is used it momentarily breaks the local circuit, thus performing the same function as the cut-off relay for the line signal, and restoring the signal.

No. 659,768.—C. E. SCRIBNER. PILOT SIGNAL FOR TELEPHONE SWITCHBOARD.

This is a pilot signal particularly adapted for use in connection with the common-battery relay boards commonly in use by Bell companies. On such boards, as is well known, the current supply during conversation is from a bridged battery, as *b* in the diagram, and this current flows both ways, to both subscriber's stations. A supervisory signal relay is interposed in the cord each side of the battery connection, each of these relays thus responding to the act of the subscriber whose current supply passes thru it. It is usual to have these relays control shunts around lamp signals, which are themselves in local circuits.




659,759. TELEPHONE EXCHANGE SYSTEM.

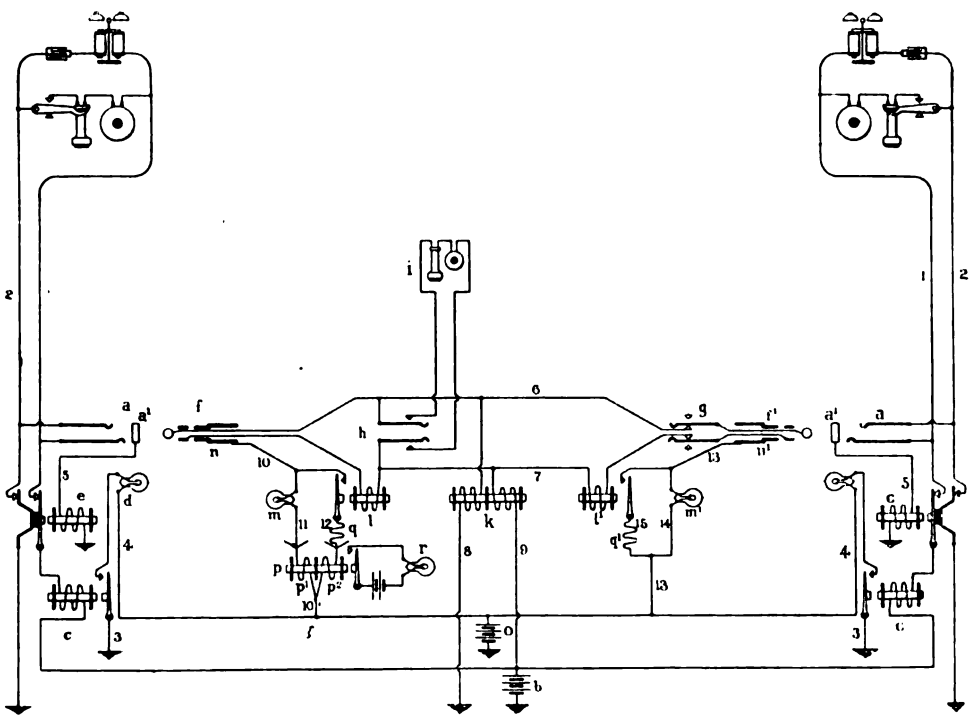
Digitized by Google

In the present invention a doubly and differentially wound relay $p$ is provided, whose windings are connected in the supervisory lamp circuit 11, and in the shunt circuit $q$, respectively. When there is current in the lamp, but the shunt is open, i. e., when the lamp lights, the pilot relay is energized and lights its lamp $r$; but when the shunt 12 is closed during the continuance of a conversation, the relay magnet $p$ is de-energized, because the current in each winding $p^1$ or $p^2$ neutralizes the effect of that in the other.

The relay $p$ may be common to a number of circuits.

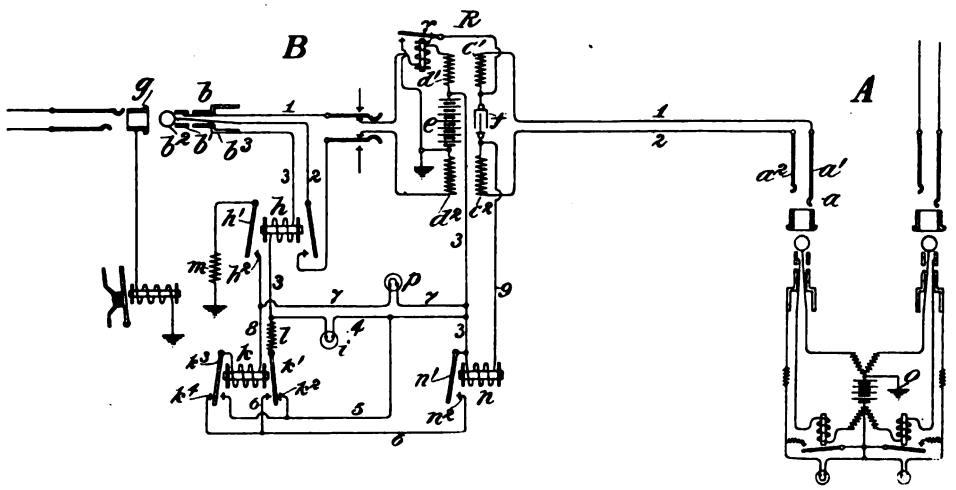
No. 659,789.—H. M. CRANE. SIGNAL FOR TELEPHONE TRUNK LINES.

In the trunking systems employed by most Bell companies, it is usual for instructions to be given over separate circuits before the trunk itself comes into use; and as soon as the B, or trunking operator, takes up the trunk plug and inserts it in the wanted jack she gets a signal (if the signals are automatic) that indicates the absence of the A operator's plug from the trunk jack, and should only appear for clearing-out. The present invention attains the end of only showing the signal to signal disconnect, and also provides a "guard signal" to show when the A plug is actually inserted, as obviously the trunking operator might be "hung up" on that trunk without advices of any description. The scheme is good, but the operation is somewhat cumbersome and complicated. Lamp $i$ is the clearing-out signal, and $p$ is the guard signal. When the girl at B gets an order for trunk plug $b$ to line jack $g$, she inserts the plug and thereby completes a circuit from ground and battery $e$ by wire 3, wire 5, armature $k'$, resistance $b$, relay $h$, to sleeve of plug and testing of jack, and so to ground by cut-off relay. There is also a path closed by wire 4, thru clearing-out lamp 4, but the shunt 5 takes most of the current. Relay $h$ is energized, closing the branch 7, $h^2$, $h^1$, $m$, to ground, and lighting the guard lamp $p$. When the A plug is placed in trunk jack $a$, current



659,768. PILOT SIGNAL FOR TELEPHONE SWITCHBOARD.

Digitized by Google

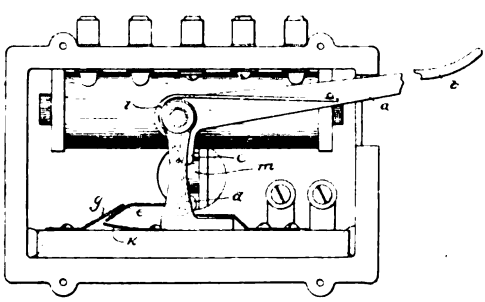



659,789. SIGNAL FOR TELEPHONE TRUNK LINES.

flows back from wire 3 thru relay *n*, and conductor 2 to ground *o* at the A office. This relay *n* then closes shunt 6, thru relay *k*, which is supposed to pull up its two armatures $k^1$ and $k^3$; this at once reverses the shunts, putting shunt 6 around lamp *i*, and shunt 5 around lamp *p*. The lamp *i* is thus controlled henceforth by relay *n*, and that relay acts in response to the movements of the A plug. When the latter is withdrawn the lamp *i* is lighted. (It is doubtful if relay *k* will really pull up its armatures. I think they will only chatter).

NO. 659,940.—A. STROMBERG. TELEPHONE SWITCH.

This is a bell-crank switch arm, with a roller *d* playing over contact springs.



659,940. TELEPHONE SWITCH.

The springs *e* and *g* are in pairs, and the spring *k* is single, the former being terminals of the talking circuit, and the latter of the ringer circuit. The single claim is very specific.

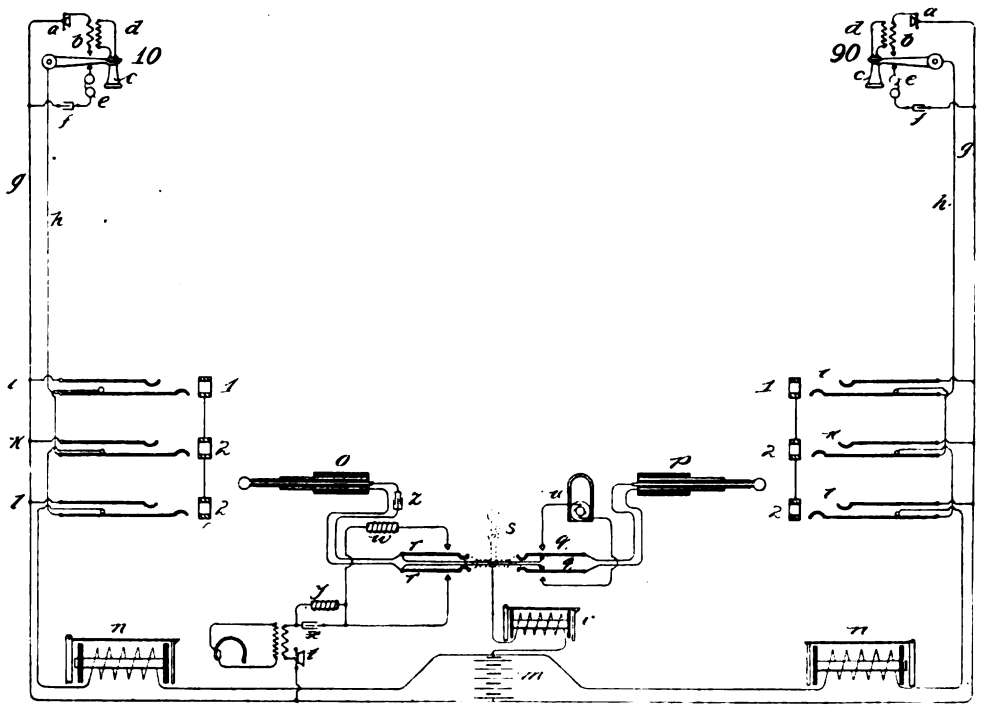
NO. 659,958.—W. M. DAVIS. TELEPHONE SYSTEM.

This is an intercommunicating system, having common battery for talking and calling. *c*, *c*, *c*, are the individual wires terminating at jacks *b*, *b*, at all the stations, and being bunched thru individual impedance coils *d*, *d*, at the batteries *e*, *o*, these coils being intended to prevent cross-talk. *e* is the talking battery, in series with the coil *k*, which prevents the operation of the signals thereby, and is itself shunted by condenser *i* for the passage of voice currents. Each station has a plug *a*, attached to its calling key *r* and its transmitter. The switch has no connection, but closes alternate pairs of springs when up or down, the upper ones to transmitter and receiver thru the primary and secondary of the induction coil, and the latter to ringer *l*, and the common return *m* of ringing battery *o*. The bells *l* may be rung even tho plugs are out of place.

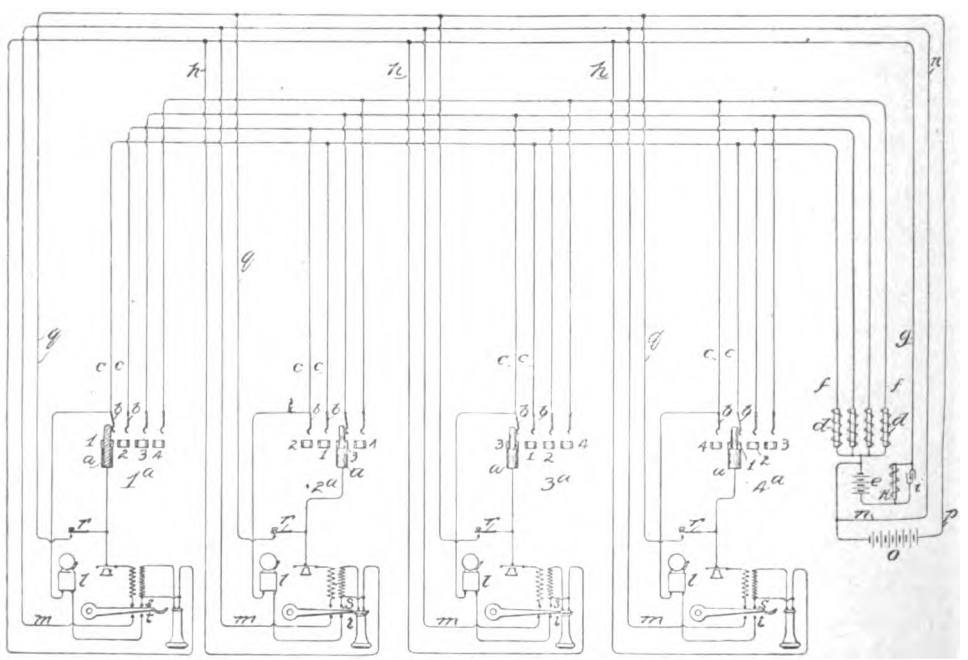
NO. 659,959.—WILLIAM DAVIS. TELEPHONE EXCHANGE SYSTEM.

This is a multiple board system, employing central energy, and the main point of the invention is in the test. *m* is the battery which furnishes current for line *g*, *h*, one side of this battery being permanently connected to the side *g*, of

Digitized by Google




659,958. TELEPHONE SYSTEM.



659,959. TELEPHONE EXCHANGE SYSTEM.

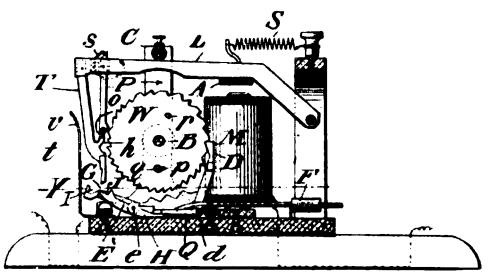
Digitized by Google

each line. The short springs of the jacks are permanently connected to this line also. The line springs are normally connected to the other side of battery, as is the side *h* of each line, but this connection is broken when a plug is inserted in any jack. Two sides of springs are provided in the cord, *r r* and *q q*. A lever *s* works both sets of springs by moving in one direction or the other, the first-named set connecting the operator's set and the second set of springs connecting the generator. When any plug is inserted in a jack 1 or 2, all of the test thimbles immediately become connected with battery thru the sleeve, and the coil *v* to battery *m*; thus when the tip of a testing plug *p* is touched to the test ring 1 or 2, a circuit is immediately completed as follows: battery *m* to operator's set *t*, by coil *y* and condenser *x* thru coil *w* and spring *r* to spring *q* and to the tip of the testing plug to the test thimble, to the sleeve of the plug in use, back by sleeve wire to spring *q* and thru coil *v* to the battery. This gives a click in the operator's desk set. Condenser *d* is inserted in the tip conductor leading to the answering plug in order to prevent short-circuiting.

*October 23.*

No. 660,439.—G. B. HOMMAN. ADMINISTRATRIX FOR W. F. HOMMAN, DECEASED, INDIVIDUAL CALLING APPARATUS.

This is a step-by-step device intended to be placed at sub-stations on a telegraph line or a series telephone line, so that each individual station may be called without alarming others. The general arrangement of the device is like that of a sounder. Armature L is pivoted between post *s*, and a retractile spring S keeps it up against a stop C. B is a wheel having long and short teeth, by means of which it is turned by the pawl P. This pawl is pivoted on the armature L, as is also a tripping lever T, whose end is adapted in downward movement to strike a lever J, which extends rearwardly under the magnets, and carries a weight F. In its outer position the lever P would strike a tripping lever I, which releases the wheel B and allows its spring to return it to zero. The operation is like this: when an individual call composed of dots and dashes (long and short impulses) is sent over the line, the armature L works up and down with a continued pull or with a short abrupt pull according to the nature of the impulse. If the impulses come in the same order as the teeth on the home wheel, long and short, that is, if the signal is for this station, the pawl P will be moved up and down short and long steps corresponding to the teeth, and so turn the wheel around until the pin *r* closes a local cir-




660,439. INDIVIDUAL CALLING APPARATUS.

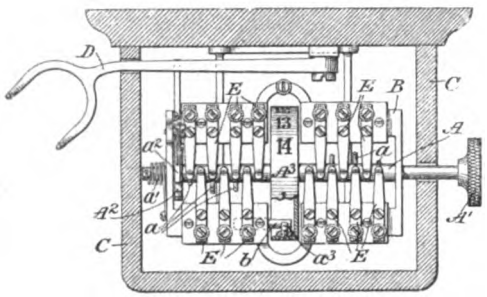
cuit device (not shown,) and rings a local bell. The long and short strokes are regulated by the lever T. This drops into the notch J or the notch I according as the impulses coming agree with the teeth on the wheel or not. If the former, the lever T will strike the lever J at every stroke, and if it is a long impulse the weight F will be raised and the wheel turned the space of a long tooth; but if it is a short impulse the inertia of the weight will not permit a long stroke, and the wheel will only be turned a short distance. If at any impulse the length of the impulse and the length of the tooth presented to the pawl do not agree, the lever T will be swung out by the point of the tooth and the next time the armature comes down lever I will be depressed and the wheel returned to zero.

No. 660,124.—L. SCHMIDT. TELEPHONE SYSTEM.

This is an intercommunicating device, of the type having movable switch arms coöperating with fixed contacts and returned to normal by hanging up the receiver. The objects of the invention are to produce a device that can be entirely enclosed, simple of manipulation,

Digitized by Google

and in which the movable part will not have so great a sweep as to make its return to normal uncertain. The principal features of the apparatus are the spindle A, carrying pins *a* arranged radially in a sinuous line around it. A set of line terminal springs E is mounted above the spindle, the whole arrangement being such that the latter may be turned to spring any one pin into contact with its




660,124. TELEPHONE SYSTEM.

corresponding spring, and only one. On the center of the spindle is mounted a drum $A^3$, carrying numbers corresponding to the stations, and these are so arranged, together with a small aperture or bull's-eye in the covering of the box, that when the spindle is turned to spring a particular pin into contact with a particular spring, the number of the station having that spring for its terminal will appear behind the window. A ratchet wheel and pawl $A^2$ $a^3$ are provided, together with a spring $a'$ to return the spindle to zero when the conversation is finished, the pawl having a tailpiece engaged by the switch hook D in its downward movement.

## WHAT KANSAS CITY WANTS FROM THE BELL COMPANY.

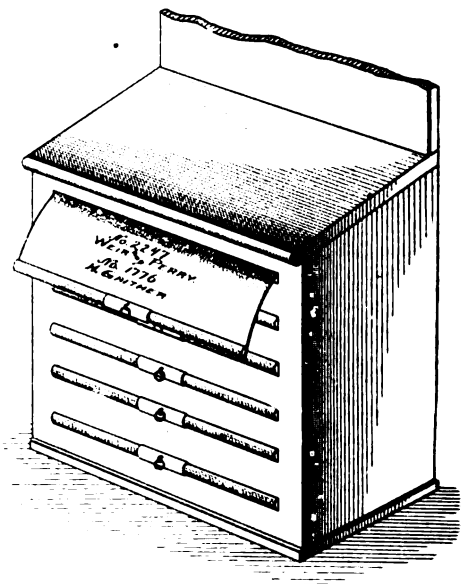
A new ordinance has been introduced in the common council. By its terms the telephone rates for business offices are placed at $60 per annum and for residences at $36 per annum. The rates are made higher than those prescribed in the old ordinance in order that no question could be raised in any court as to the reasonableness of the charges.

The telephones now in use belong to a class long since discarded.

The Bell Telephone Company has wronged Kansas City for a long time.

## NEW TELEPHONE DIRECTORY.

The telephone directory is always a necessary adjunct to the instrument itself, and any device which will render it convenient for consultation while at the 'phone will be appreciated by persons having occasion to converse over the



wires. In the picture we illustrate the invention of William J. Bell, of Baraboo, Wisconsin, which provides a directory that will always be in its place when wanted and can be consulted without hanging up the receiver, as is necessary when turning the leaves of a book directory. The front of the battery box is provided with horizontal slots, and inside the box are mounted a number of spring-controlled rollers. The printed sheets are secured to the face of the rollers by spring jaws, which permits a sheet to be replaced easily when it is desired to correct the directory. The outer edge of the sheet is provided with a lettered handle for use as an index to the directory, and only a moment is required to select the required letter, pull out the sheet and find the name. For use on small lines the inventor provides an endless sheet, which is placed on two rollers in the top of the box, with a glass plate to allow inspection and a crank to rotate the sheet until the name is found.

Digitized by Google

## TELEPHONE PRINCIPLE ADAPTED TO RAPID TELEGRAPHY.

Much interest was caused during the early months of this year by the fast telegraphing apparatus invented by two Hungarian scientists, Herren Pollak and Virag. By means of this system it has been found possible to telegraph 2,500 words per minute in Morse characters over long wires. The inventors now report a most extraordinary development, which will cause intense interest among telegraph experts. Their first system involved the use of a telephone membrane, of which the vibrations were recorded on sensitized paper by means of a small mirror which reflected a ray of light thru a lens. While experimenting with this apparatus it was found that the vibrations could be so controlled that letters could be written in Latin characters intelligible to the untrained eye. The letters it was possible to produce, however, were only those which were formed of up and down or forward motions of the pen, such as m, n, w, etc. This led to experiments which aimed at producing the other letters. The means were at length discovered.

By using two telephone membranes, which are both attached to the same mirror, and whose movements can be combined and controlled at the sending end, it has been found possible to imitate all the motions of the pen and write messages in a clear, round hand in Latin characters at the extraordinary speed of 1,000 words per minute. The words are written on an endless slip of sensitized paper seven centimeters in width. This slip of paper passes downward and is developed and fixed by an automatic process, so that it leaves the apparatus quite ready to be gummed to a form and issued to the receiver. The fastest printing telegraph at present employed is the Baudot, which will send 4,000 words per hour over one wire. The new invention will send 24,000 words per hour by the use of two wires, so that it is six times faster than the fastest system at present in use. In England the duplexed Hughes yields 1,800 words per hour, and the vast Wheatstone apparatus yields 24,000 words, which are, however, in Morse code, and require translation. The new system, therefore, bids fair to take its place at the head of the high-speed telegraph systems of the world.

The messages are sent by means of a specially prepared slip bearing five series of perforations, which can be prepared very rapidly, one impression being all that is necessary for perforating the combination of holes necessary for each letter. At the receiving end the operator watches the writing on the sensitized paper thru a ruby glass window. The United Electrical Company, of Budapest, is financing the invention.

---

## TRAIN TELEPHONES.

Telephones are being fitted in the cars of the St. Charles Rock Road and Western Company, which extends into St. Louis County, Missouri. They will enable the motorman to communicate with the sheds, wrecking-car offices or crews on other cars. Passengers will be able to talk with friends and tell them when to expect them. The instrument is placed in the rear of each car, the negative wire being connected permanently thru the wheels to the rail and the positive wire being fitted with a simple device resembling a jointed fishing pole, by which connection is secured with a private overhead wire paralleling the trolley. The device is the invention of J. D. Haussman, president of the company. Mr. Haussman expects to introduce his invention upon railroad trains, and believes that the system would effectually prevent head or rear end collisions, as the conductors could be constantly in communication with each other while the trains were in motion between points.

---

## DELAYED CONSTRUCTION IN YUKON.

Mr. J. B. Charleson, superintendent of Yukon telegraph construction, has arrived at Ashcroft from Quesnelle. On his arrival, Mr. Charleson found a report from Mr. J. Y. Rochester, who has charge of the work of construction south from Telegraph Creek. Mr. Rochester states that the line is complete to a point approximately 167 miles northwest of Hazleton, and that owing to deep snow,

Digitized by Google

severe weather and the daily loss of animals, he is compelled to suspend further work on the line this winter. The line is complete from the south to a point 157 miles northwest of Hazleton, so that allowing for the unexplored and unsurveyed country thru which the line passes, a distance of not more than fifteen or twenty miles separates the two ends.

Mr. Rochester could only continue the work at imminent risk to the lives of his party, and much as he regrets abandoning the work, with the completion almost within reach, he deemed it prudent to take no risks, but to return to Telegraph Creek, while he had the chance.

The steamer Amur, from Skagway, brought the men to Vancouver who have been working on the Government telegraph line to Dawson and who have suspended work until spring. These northern linemen found traces of intercontinental wire which was projected and actually begun to connect North America with Europe by way of Siberia.

On the summit of a lofty mountain near Telegraph Creek they found a stake or surveyor's picket, which marked the old enterprise, and they also discovered the remains of the old wire, which is still up in places.

---

## LODGE SYSTEM OF SIGNALING.

A large number of inquiries have been received asking for information or explanation of the Lodge system of signaling. Briefly the system provides for the constant agitation of the coherer, which, after the immediate action of the wave, will otherwise remain in a conductive condition. The system provides a mechanical means of producing a jar or shock, and the device for doing this consists of a mechanical tapper worked either by a clock or electrical mechanism.

On several occasions Doctor Lodge demonstrated that such coherers could be used in transmitting signals for either telephone or telegraph for a considerable distance and also proved that it was possible to signal thru a solid wall.

Sylvanus P. Thompson refers to Dr. Lodge as being one of the most able men experimenting in the field of wireless telephony, and the following letter written to the London (Eng.) *Electrician*, by the Doctor, on the subject of coherers, will be of interest:

*To the Editor of the Electrician:*

SIR,—There seems to be a tendency to regard the metallic cohesion which occurs under the influence of an imperceptible spark as a *theory*, whereas it is a fact. I observed the fact ten or eleven years ago, and published it in the *Journal Inst. E. E.* for 1890. Professor Hughes had observed it before, so had S. A. Varley before that. I spoke of it as an apparent extension or reaching of the force of cohesion across a molecular gap under the influence of, as it were, an electrical *flux*.

Whatever it be due to, there can be no question that metals such as brass and iron, when in light contact, do cohere under the influence of electric waves, for they can be felt to have stuck together. So also filings mat themselves visibly together on a glass plate, and can even be got to hang as a string, one suspended from another.

Prof. Chunder Bose's observations and further investigations are interesting enough, and I am glad to call attention to them, but no amount of investigation or "correspondence" can disturb the above physical fact. There may be, and apparently are, anti-coherers which act in an opposite direction, but certainly there are coherers. Yours, etc.,

OLIVER J. LODGE.

The University, Birmingham, Oct. 6.

---

## SOUTH AFRICAN TRADE.

The race for business in the three principal countries of South Africa is just beginning. Telephones and telephone construction and line men are in great demand. The tax on salesmen, annually, in the three countries is about $216. The traveling expense on the line of the railroads will average $12 per day.

A good salesman familiar with the customs of the country will secure much more business than can be obtained thru established agencies. The usual route taken by salesmen is Cape Town, Port Elizabeth, Middleburg, East London, Queenstown, Durban, Pretoria, Kimberly, Bloemfontein and Beauford West, or he may start from Delagoa Bay and visit the Transvaal before going south. A complete line of samples is necessary. The trade won't look at pictures but want to see the goods.

If advertising is to be used to get the business it should be high class and clearly worded in both English and German. While local credit to good

Digitized by Google

firms run from three to six months, marketable goods can always be sold at a fixed term of sight draft attached to bill of lading.

### ACID TEST FOR PAINT.

A very simple and reliable test to detect the presence of acid in paint to be used around the switchboard and cable box, is to put small quantities of the paint in copper dishes, which may be easily made by hammering them out of sheet copper.

If acid is present it will attack the copper and produce verdigris. If the copper turns green the paint contains acid. The copper dish should be covered from dirt or dust during the test.

### A NEW DESK 'PHONE.

We herewith illustrate the new form of desk set now being manufactured by the Century Telephone Construction Company, of Cleveland.

This telephone attracts attention immediately thru its pleasing outlines and symmetrical construction. The base and metal parts are highly nickel-plated, and the stand is covered with highly polished hard rubber.

So many manufacturers are using a stock form of desk telephone, presenting no attractive features, that it should interest exchanges to know they can purchase a high-grade desk telephone of a newer and more elaborate design than has yet been placed on the market.

Each desk telephone is fitted with the new century long-distance transmitter, manufactured by this company; also their new double-pole receiver, and an entirely new form of switch hook. This hook is positive and accurate in its action, and is so very substantial as to make it next to an impossibility to get it out of order.

This desk 'phone is furnished either with or without generator and extension bell, and each and every telephone is guaranteed to give the highest possible class of service. Parties needing a high-grade desk set that will give good service for indefinite time without getting out of adjustment, will do well to try some of these telephones.

### EXTENSIONS NEAR HOME.

The Ogle County (Ill.) Telephone Company will soon have a full metallic toll line from Rochelle to Oregon, Mount Morris, Polo and Woosung, where it will connect with the Lee County system.

Another branch is now being built from Polo to Eagle Point, in Carroll County, and Mr. Zinnell of that county is putting in a metallic line from Eagle Point to Mount Carroll, which connects with the Jo Daviess County line to Galena and intermediate points. This gives a continuous metallic line from Sycamore, De Kalb County, to Galena, Jo Daviess County.

The Northern Illinois Telephone Company, which operates a system in the south part of De Kalb County, has purchased the Earlville, La Salle County, Exchange, from the Lee County Company and intends giving La Salle County a complete and first-class system as fast as possible.

YOUR magazine is the only one I care to read. S. F. KUHN.

Digitized by Google

## LONG DISTANCE TELEPHONY IN NORWAY.

H. M. Consul-General at Christiania, Norway, has forwarded to the foreign office a despatch reporting that telephonic communication has been established between Christiania, Gottenburg, Malmo and Copenhagen. The rates for conversation between these cities are as follows: First district on Danish and Norwegian exchanges east of Porsgrund and south of Lillehammer, the rate for three minutes talk is equal to 50 cents American money and for a longer distance 12½ cents are added for each district beyond the first. Prepaid conversations utilizing the line at a given time are charged for at three times the regular prices. An extra charge of 5 cents is made when the party talked to has to be summoned. These rates are not subject to special contract, except in the case of government business.

## WESTERN'S NEW BUSINESS.

The Western Telephone Construction Company, of Chicago, Illinois, has recently made shipments of a 600-multiple transfer switchboard and a 600-line combined cross-connecting and lightning-arrester board to the Shamokin Valley Telephone Company, of Shamokin, Pennsylvania, and 100-line Western Express switchboards to the Home Telephone Company, Chillicothe, Ohio, and the Citizens' Telephone Company, Montevideo, Minnesota. This company is also building a 100-wire addition to a 500-multiple central-energy switchboard lately furnished by them to the Schuylkill Telephone Company, of Pottsville, Pennsylvania. They have also closed contracts with the Staunton Telephone Company, Staunton, Illinois, for a one hundred Western Express switchboard and seventy-five magnetos, and with Dr. J. H. Close, New Boston, Illinois, for a 100-capacity switchboard; also for a 100-drop switchboard for the Columbia Telephone Company, of Columbia, Pennsylvania. Another contract has been closed to furnish the North Oklahoma Telephone Company with a 225-drop switchboard. Orders are strong for the New Western Express No. 3, 5-bar bridging telephones. These instruments are built especially for heavy toll-line work and for farmers' lines.

## RUSSIAN SYSTEM SOLD.

The Telephone systems of the Russian cities which have been heretofore operated by the State will be sold at auction November 20. It is understood that the St. Petersburg municipal government will bid for the franchise.

## A NEW TRANSMITTER.

The rapid progress made by the manufacturers of Independent apparatus during the past two years is a source of amazement to the public at large, especially the Bell Company.

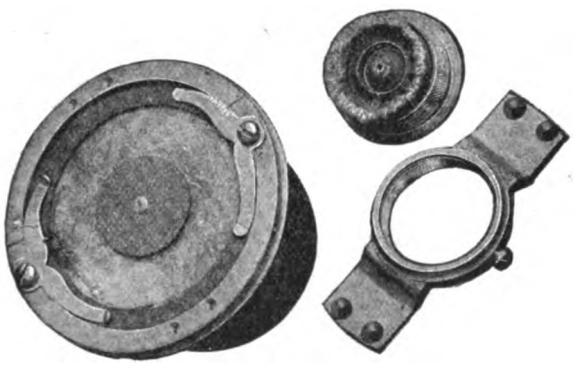
One of the most notable improvements in Independent telephony is that of the new solid back transmitter recently placed on the market by the Eureka Electric Company. This transmitter is designed along lines heretofore impossible to accomplish. It is the result of several years of painstaking experiments. In designing this transmitter it was realized that the Hunnings form of transmitter had outlived its usefulness, which was due principally to the fact of the rapid increase in toll lines and inter-state connections thruout the entire Independent field. While the Hunnings transmitter answered its purpose in the first years of Independent telephony, it was found to contain a number of inherent defects, which was next to an impossibility to overcome.

The Bell Company discarded the universal transmitter several years ago, which was practically a perfected Hunnings transmitter, and adopted what is known as the "White Solid Back." At first sight it would appear to be a comparatively easy matter to design a transmitter that would rank equal, if not superior, to the "White Solid Back," but on careful investigation it was found that while the patents covering the "White Solid Back" of the Bell company are extremely narrow in their scope, it was found that this instrument was built to some extent by a secret process, and is continued to be built in that manner. A "White Solid Back" transmitter is never allowed to be opened or

Digitized by Google

examined for the purpose of repair by any local telephone company's employes. If a transmitter of this type does not work satisfactorily, it is returned to the home office in Boston, where experts remedy the difficulty.

It was also found that a special carbon was imported to this country from Germany. However, the Eureka Company, notwithstanding the numerous obstacles above mentioned, determined to produce a transmitter that would equal, if not surpass, the Bell "White Solid Back"; and it is a source of congratulation to this company that it has not only produced an instrument its equal, but far surpasses in a great many points the solid back of the Bell Company. The transmitter was designed with a due regard for the patent rights of others.



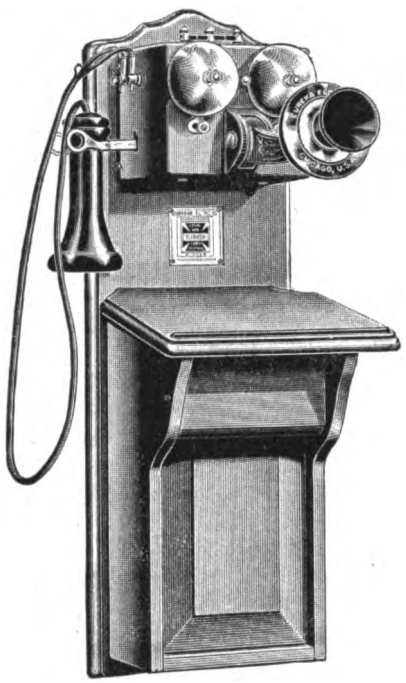
After numerous experiments covering a considerable period, it was found that it would be necessary to procure special carbon, and independent experiments were conducted along these lines, until a satisfactory carbon was produced, and all the carbon used in the production of this transmitter is made under the special directions and in the factory of the Eureka Company. The transmitter produced is found to stand phenomenal electromotive force at a large amount of energy. At the same time it can be readily adapted to a low electromotive force. The increasing or decreasing of electromotive force in this transmitter does not mar the quality of tone. In the increase of electromotive force it simply renders the volume stronger.

One of the best points scored by this transmitter over the "White Solid Back" is, that it is an adjustable transmitter. The engineers of the Eureka Electric Company had a double purpose in designing the new transmitter. First, that they would procure an instrument suitable for the most exacting toll line work, and again, one that would be a fit transmitter for the central energy system. In designing this system a new factor was taken into consideration. Heretofore, the central energy systems had not been within the reach of the small telephone exchange operator, as it generally necessitated the employment of a very competent electrician for the operation of the plant. However, the central energy system of the Eureka Company is so simple in its principle, and yet at the same time complete in its operation, that an ordinary telephone exchange manager has no trouble in comprehending any of the workings of the different parts, and it does not entail any more work or ability on the part of the manager than the operation of the ordinary magneto-call system, and at the same time every desirable feature has been covered, and a number of new improvements have been accomplished, making altogether a system that is second to none, not excepting even the individual relay central energy system adopted by the Bell Company in their largest exchanges.

A novelty recently adopted by the company is its Universal Central Energy Instrument. This instrument has so been designed, equipped with condensor and necessary apparatus, that it will operate quite satisfactorily in any central energy exchange in any part of the country, owing to the fact that its new

Digitized by Google

transmitter is capable of adjustment for any practical voltage. Owing to the general lines of construction, similar to the "White Solid Back," the resistance of the transmitter is exceedingly high, which is generally conceded by experts



to be an advantageous feature for central energy apparatus, while at the same time it is desirable, even in the operation of a local battery design of instrument, as the local batteries do not so readily exhaust themselves in a high-resistance circuit. There are transmitters on the market, whose resistances in the primary circuit normally are no higher than nine ohms, while in this solid back transmitter above described, the resistance varies from 40 to 65 ohms.

While contemplating the multiple boards for the largest exchanges, the fact has not been lost sight of, with a due regard for cost, that a multiple board can be designed for the smaller exchange owners of 500 lines or more. Multiple boards are being built for magneto systems, straight central energy, or, where the general construction of the telephone plant does not warrant the adoption of central energy system, the common battery system is recommended, a system which is both automatic calling, with visual signals and automatic disconnections, but where batteries are used for the local microphones in each instrument. The multiple board is so designed that it furnishes a full supervisory of all connections at all times.

## A METALLIC CEMENT.

A metallic cement may be applied to the joint by hand after the wires are twisted or secured together without the use of heat, and for all practical purposes takes the place of solder. The cement consists of an amalgam, with which is mixed a binding material, the mass having about the consistency of putty. When put up in stick form, the cement will not harden, except at the surface, where a slight crust is formed, and when the mass is worked between the fingers it becomes soft and plastic, so that it may readily be applied to the wires. In making a joint the wires are twisted or secured together, and the joint formed is coated with the cement.

The cement consists of the following ingredients in the proportions specified: Zinc, four parts; tin, two parts; copper, two parts; cadmium, two parts; bismuth, four parts; lead, two parts; antimony, one part; and mercury, eight parts. The solid metals are granulated and melted together, after which the mercury is added, the mass being stirred at the same time. When cool the mass is pulverized in a mortar, and a binding material consisting of liquid glucose and silicate of soda, in sufficient quantity to bind the mass together and give it the consistency of putty, is added to the mass. The cement thus formed will not harden when in bulk, and may easily be worked between the fingers; but when spread out upon a joint, it not only adheres to the latter, but hardens in from twelve to twenty-four hours. The cement may be applied to the wires without any previous application of acid, and by amalgamating with the conductors it forms as perfect an electrical union as could be formed by the application of solder. The application of the cement prevents oxidation of the wires. After the joints are thus made they are covered with an insulating tape.

Digitized by Google

## NEWLY DESIGNED AMERICAN TELEPHONES.

The American Electric Telephone Company has recently placed upon the market a new type of central energy and magneto call telephone. These instruments are designed so that two dry batteries may be used in place of equipping the telephone instruments with the usual cumbersome battery box.

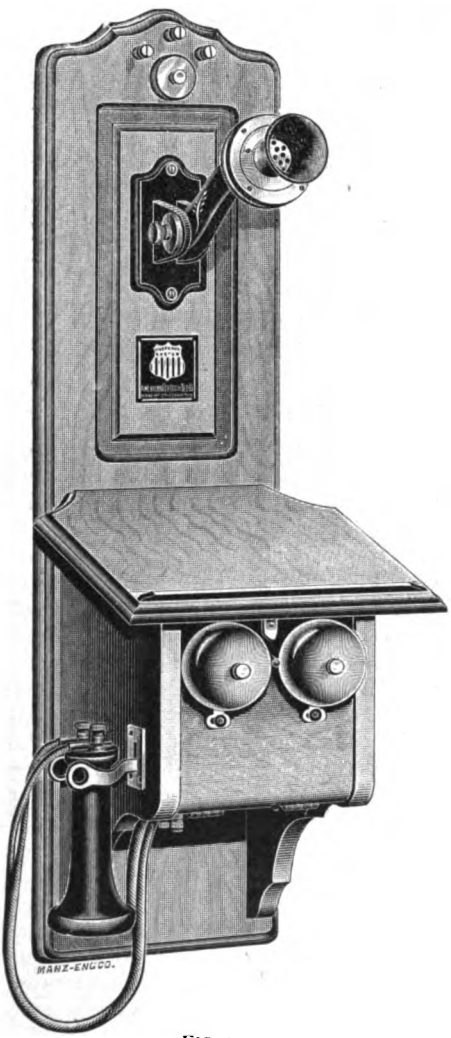



FIG. 1.

Fig. 1 shows the central energy telephone. This instrument may be used in connection with either full central energy or centralized call switchboards, a place for the batteries being reserved immediately behind the signal bells. The top or writing table is so arranged that it may be lifted away from the equipment, and the bells allowed to swing forward, thus exposing all of the operative parts of the equipment. In addition to being equipped with a new style long-lever switch hook, the equipment is supplied with lightning arrester, long-distance induction coil, Bell style receiver and long-distance central energy transmitter, which is shown mounted on an adjustable arm.

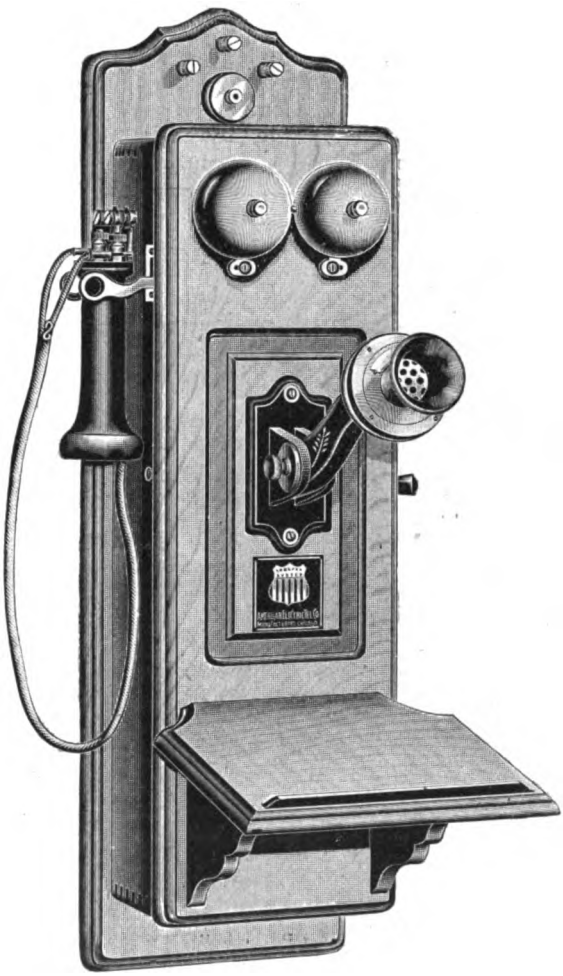


FIG. 2.

Fig. 2 shows an equipment that can be used in connection with local ex-

Digitized by Google

change or toll-line circuits. The receiver, switch hook, transmitter and induction coil are of the highest possible grade and efficiency. The generator used in this equipment may be of the regular local exchange type or special high-efficiency toll-line work, either for bridging or series system; the magneto ringer being of the long or short coil type, depending upon whether the equipment is to be used in connection with series or bridging lines. The lightning arrester is similar to that shown in Fig. 1.

The operative elements of this equipment are accessible by swinging the entire front to the right and thus exposing all of the parts mounted in the box.

The American Company announces that it is now in position to supply instruments of the above construction in any desired quantities, and wire the equipment for any desired service, whether it be for local exchange, series or bridged toll, central energy or centralized call system.

## DECISION AFFECTING TELEPHONE FRANCHISES.

The Supreme Court of Ohio in the case of the City of Zanesville *vs.* the Zanesville Telegraph & Telephone Company has declared invalid section 3461 Revised Statutes, which relates to the action that may be taken by a telephone company when it is refused a franchise because of undue local influence. In that event the law, under this section, provided that the County Probate Judge shall appoint a commission whose duty it shall be to determine and specify the location and construction of the telephone lines — and whose favorable report permits the building of the lines without the necessity of obtaining the necessary votes for a franchise from some obstinate council. It was under this section of the law that the Zanesville company started the construction of its exchange when injunction proceedings were brought on the ground of testing its validity, and the case was carried to the Supreme Court. The decision of the Court maintained that the granting of a franchise was legislative in its character and that this power could not lie within the jurisdiction of the Probate Court. It is sweeping in its character and directly affects the twenty-one companies operating under section 3461.

A number of companies delayed construction awaiting this decision, and these, like the companies already doing business under the wing of the Probate Court, will simply find it expedient to make the best terms they can with their respective councils for their franchise This is hard luck for the Independent companies, even tho it is confined to the State of Ohio, but the remedy lies in forcing an issue on the question between a hard-headed council and the public.

This may take time, but it will take less time than finding cause in a court of law; and paying out money for legitimate expenses in educating any particular public to the justice of granting a fair franchise is cheaper than buying votes.

## BELL TELEPHONE OFFER.

The Southern Bell Telephone Company will probably submit a petition to the city council of Richmond, Virginia, asking for the right to occupy the streets of the city with its poles and wires and to do a general telephone business here.

Several years ago the old franchise of this company expired and the council refused to renew it. The company was directed to remove its poles and wires, but declined to do so, and the city authorities were about to chop down the poles when the company went into the United States Circuit Court and sued out an injunction restraining the council from taking this step.

Since then the case has been heard in the Federal courts on its merits, and decided in behalf of the city. An appeal has been taken to the United States Supreme Court, where it is now pending.

It is said that the Bell Company, in asking for a franchise, will offer to reimburse the city for all the expense that the litigation has entailed; to pay all back taxes, with interest and penalties; to put its wires under ground in the central part of the city, and to put in an entirely new metallic system. The Richmond Telephone Company will make a big fight against the franchise.

Digitized by Google

# TELEPHONE NEWS.

(*Commencing October 25, 1900.*)

YORKVILLE, S. C., has an Independent telephone exchange.

ATLAS, ILL.—A new telephone line thru here is nearly completed.

MANITO, ILL.—There will soon be a local telephone exchange here.

GLOBE BELT, ARIZ.—The telephone system here has changed hands.

BERWICK, Illinois, is soon to have an Independent telephone exchange.

DANVILLE, ARK.—A local company has been granted a franchise here.

FAIRFIELD, WIS.—Work on the new telephone line is progressing rapidly.

LIVONIA, N. Y.—There will soon be a local telephone exchange in this place.

ALEDO, ILL.—The Millersburg Telephone Company has elected a new set of officers.

NEW PARIS, OHIO.—Farmers around here are organizing a rural telephone company.

KENT, OHIO.—The Home Telephone Company is rapidly extending its northern lines.

DAVENPORT, IOWA.—The telephone company here has sold out to the Central Union.

CHICAGO.—The Illinois Telephone Construction Company filed articles of incorporation for $2,500.

REYNOLDS, ILL.—A new telephone line between here and Taylor Ridge has recently been constructed.

SUPERIOR, NEB.—The Nebraska Telephone Company is extending its line into Ragan, from Sacramento.

CAMPBELL, N. Y.—Campbell & Risingville Telephone Company filed articles of incorporation for $1,000.

THE Waushara Telephone Company, of Berlin, Wisconsin, is building an exchange at Wautoma, Wisconsin.

SUN PRAIRIE, WIS.—The new telephone line connecting Token and Sun Prairie will soon be in working order.

ITHACA, N. Y.—The Automatic Independent Telephone Company is preparing to establish a system in this city.

BATH, N. Y.—Local capital has been pledged for a local telephone exchange here.

BLAINE, ILL.—The people are trying to organize a new telephone company here.

MANSFIELD, OHIO.—Franchise was granted to the Star Telephone Company.

DOWAGIAC, MICH.—The people of Dowagiac are constructing a new exchange.

BINGHAMTON, N. Y.—A new telephone system here is being installed rapidly.

DWELLE, MINN.—The Dwelle Telephone Company has its system nearly completed.

THE Bell Telephone Company has increased its capital stock in Cincinnati to $1,250,000.

WILLIAMSTOWN, PA.—A new telephone exchange here will soon be ready for operation.

CADWELL, OHIO.—Cadwell Independent Telephone Company; capital stock, $5,000.

JACKSONVILLE, ILL.—The Illinois Telephone Company has been granted a franchise here.

WEBB CITY, MO.—A new telephone line between this place and Joplin is nearly completed.

CORSICANA, TEXAS.—Work on the new Independent exchange here is progressing very rapidly.

STAUNTON, VA.—The Independent company at Staunton is successfully fighting the Bell monopoly.

AKRON, OHIO.—Under the management of P. Wade the Home telephone system is rapidly progressing.

IOWA CITY, IOWA.—The Johnson County Mutual Telephone Company has completed its exchange at Sharon.

AMSTERDAM, HOLLAND.—Municipal telephones have been tried in several foreign cities with considerable success. Amsterdam bought out the private tele-

Digitized by Google

phone company four years ago, and the results have been exceedingly beneficial.

ALTON, ILL. — Kinloch Telephone Company will apply for a franchise here.

BOISE, IDAHO. — The Independent Telephone Company here is rapidly pushing the work on its exchange.

ANDERSON, TEXAS.— The new telephone line from Anderson to Stoneham and Plantersville was recently opened up.

LEXINGTON, KY.— A company here is trying to secure a franchise to construct and operate a telephone exchange.

LINTON, IND.— An Independent telephone line has recently been put in operation between here and Bloomfield.

HUGUNOT, N. J. — The citizens of Hugunot feel very much elated over the work of their new telephone exchange.

CONNEAUT, OHIO. — The Conneaut Telephone Company has increased its capital stock from $30,000 to $50,000.

COLORADO SPRINGS, COLO.—A number of linemen employed by the Colorado Telephone Company are on strike.

CANON CITY, COLO.— The New Telephone Company is doing quite a bit of constructing in the surrounding counties.

LOUISVILLE, KY.—There is an application for a franchise by an Independent telephone company up before the council here.

SPRING VALLEY, ILL.— The Spring Valley & Princeton Telephone Company will soon have its local exchange in operation.

THE Northern Illinois Telephone Company has acquired the property and franchises of the Lee County Telephone Company.

SHELBYVILLE, TENN.—Citizens' Telephone Company has been organized here to build and operate a telephone exchange.

THE Bell Company is more than likely to have a lively competitor in the United States Telephone Company thruout Michigan.

THE Continental Telephone Construction Company, Chicago; capital, $2,500; incorporators, Henry Shafer, S. W. Moon, Frank L. Bills.

CUYAHOGA COUNTY, OHIO.— Telephone systems in this county have a total valuation of $1,488,938. Half of this is controlled by the Bell Telephone Company.

SEBRING, OHIO.—Franchise has been granted a local telephone company to build and maintain a telephone exchange at this place.

WEST MANCHESTER, OHIO.— The West Manchester Independent Telephone Company, Preble County; capital stock, $1,000.

HARRINGTON, WASH.— A local telephone exchange has been established here and is rapidly increasing its number of subscribers.

CENTERVILLE, IOWA.— Iowa Company absorbed. The Iowa Telephone Company has been merged into the Central Union.

DES MOINES, IOWA. — The Mutual Telephone Company is in a large sense a municipal institution. It should be sustained and perfected.

HARTFORD CITY, IND.— The proprietors of the Hartford Telephone Company have purchased a number of systems in the surrounding countries.

NORTH ALEXANDRIA, OHIO.— The Independent telephone people are pushing the work by putting in their instruments as rapidly as possible.

CORTLAND, N. Y.— Nearly all the telephone poles of the Home Telephone Company are now up, and the exchange will soon be in working order.

ALBANY, N. Y.— The Remsen and the West Canada Creek Telephone Company, of Remsen, Oneida County, New York; capital stock, $2,000.

ROCHESTER, N. Y.— A mortgage for $125,000 has been recorded in Yates County Clerk's office. The name of the mortgagor is the Empire State Telephone & Telegraph Company.

SEA CLIFF, L. I.— Telephone war is on between the New York & New Jersey Telephone Company (Bell Company), and the South Shore Telephone Company (Independent Company).

BRAZIL, IND.— A novel telephone company has been formed here. The company consists of a number of farmers and merchants. Each individual owns his own 'phone, and pays his share toward the construction of the line. Leading member of the company, William F. Kattman, Poland, Indiana.

Digitized by Google

## TRADE ITEMS.

THE Electric Appliance Company, Chicago, carries in stock for quick shipment a full line of telephone parts, such as single and double pole receivers, transmitters, bells, induction coils, hooks, etc.

CHARLES T. YERKES has sold to the Stromberg-Carlson Telephone Manufacturing Company the property — 75 by 156 feet — in Clinton street, 100 feet south of Jackson boulevard, east front. The grantee is a corporation doing business under the laws of Illinois. The consideration expressed in the deed, which was dated October 15, is $19,000.

OWING to greatly increased business the Western Telephone Construction Company, Chicago, has recently enlarged its factory space 10,000 additional square feet. Besides other large orders, this company secured the contract to furnish the Corsicana (Texas) Telephone Company, with a 1,200 capacity central battery telephone equipment. The Western claims to have sold more multiple central battery equipments during the past six months than any other manufacturer.

THE Eureka Electric Company is now distributing its "20th Century" catalogs. They state that this catalog is the handsomest, as well as the largest and most complete telephone catalog ever issued. It is certainly a work of art, and should be in the hands of every telephone company, interested in telephones, switchboards, cable-head protectors, and other items of telephone apparatus. The company will be pleased to forward copy gratis to any company desiring the same. It contains valuable information outside of describing the large line of Eureka Apparatus.

## LONG-DISTANCE EQUIPMENT IN HOTELS.

Another evidence of the fact that Buffalo is a city of the first class, was furnished when the long-distance system was installed in every one of the 500 rooms of the Iroquois Hotel at a cost of $25,000.

Every guest sitting in his or her room can by this system communicate with the outer world as far East as New York, and as far West as Chicago. The guest can also communicate with every room in the house, and respond to calls from down-stairs. For these added privileges the guest pays no extra charge, except the ordinary rates for telephoning. The electric bell system is entirely displaced by the new device.

It might be supposed that so enormous an increase in the volume of telephoning would be attended by a nerve-rending noise. The incessant tinkle-tinkle of the bell is completely obviated by an ingenious and pretty device. If, say No. 70 calls the operator, a tiny pearl button becomes suddenly suffused with light. The operator's eye is attracted to the number. He immediately responds. The completion of the required connection is indicated by another tiny illumination, and still another light tells that the guest has finished talking and hung up his receiver. The "Central" call is indicated on a separate row of buttons operated on the same noiseless plan. So quickly is the whole business done that the keyboard occupies a small corner of the writing-room, without disturbing the correspondents seated at adjoining desks.

There are only a few hotels in the country that can boast of this perfect service. Up to last night the longest distances covered from the rooms of Iroquois Hotel guests were Cleveland and Lyons. It worked admirably.

"Give me Cleveland," calls the guest.

The operator connects with the regular telephone office, which still does business at the old stand in the reading-room, and presently the guest is able with his voice to annihilate the distance which but a few seconds before separated him from the Forest City.

In the opposite direction it works like this:

"See if 469 is in," is the message conveyed by the colored porter. "Tell him a gentleman from the Mutual Life building would like to see him."

The operator complies. It is all the work of a few seconds and, thanks to the illuminated buttons, disturbs no one. The new system extends to every department of the house.

Digitized by Google

## Wanted.

COMMENCING WITH THE DECEMBER ISSUE, we will add to our paper want columns, which will appear on this page under the heading of "WANTS." They will be classified under the following heads:

HELP WANTED,
SITUATIONS WANTED,
STOCK WANTED,
CAPITAL WANTED,
EXCHANGES FOR SALE,
MATERIAL FOR SALE and
MISCELLANEOUS WANTS.

The rate under these headings will be seven cents per word.

---

A POSITION as manager of independent telephone exchange. Will take working interest. Have had eight years' experience. Am now holding position as foreman for an electric construction company in Missouri. Address J. C. C., care TELEPHONE MAGAZINE

---

POSITION as manager and electrician for exchange of from 200 to 500 subscribers. Experience in construction, operation, etc. Best of references. Address A. B. C., care TELEPHONE MAGAZINE.

---

AN EXPERIENCED REPAIRER, one who understands switchboards, cables and general telephone repairing. Address James R. Dee, Manager Michigan Telephone Co., Houghton, Mich.

---

**Charles A. Brown & Cragg,**

**ATTORNEYS AT LAW and SOLICITORS of PATENTS,**

**1450 Monadnock Block, CHICAGO.**

---

EDWARD E. CLEMENT. WM. D. GHARKY.

**CLEMENT & GHARKY**

**Patents and Patent Law**

**GENERAL ELECTRICAL EXPERTS**

**SEARCHES, REPORTS, OPINIONS**

Stephen Girard Building, PHILADELPHIA.
McGill Building, WASHINGTON, D. C.

---

**The Inland Printer**

$2.00 per Year.
20c. per Copy.
Published Monthly...

The Leading Trade Journal of the World in the Printing and Allied Industries.

NO matter what line of trade you are in, if you like nice printing or have anything to do with advertising or art work, this magazine will be a most valuable aid. Every issue is a gem. You need it. Send 20 cents for a sample copy. It is worth double that price.

**The Inland Printer Co.**
PUBLISHERS,
212-214 Monroe Street,
CHICAGO.

---

like the Sphinx the "McRoy" conduits will stand as buried monuments for all time.

JOHN T. McROY
302 BROADWAY, NEW YORK
138 WASHINGTON ST., CHICAGO

Digitized by Google

# Telephone Magazine

Copyright, 1900, by Electrical Engineering Pub. Co.

Entered at the Chicago Postoffice as mail matter of the Second Class.

VOL. XVI. CHICAGO, DECEMBER, 1900. NO. 111

## TELEPHONE SWITCHBOARDS.

BY H. P. CLAUSEN.

(*Continued.*)

In the past few years there has been a constantly increasing tendency to re-equip old magneto exchange systems with centralized battery apparatus; therefore, the writer believes that it will be of interest to the reader if the subject of centralized battery systems is presented in an easily understood manner. The subscriber's equipment in a centralized battery system need not be described in detail, as the usual forms comprise everything common to the ordinary magneto-call telephone, discarding, of course, the call-transmitter and the local transmitter batteries and adding quite frequently a condenser, and in some less important systems differentially wound resistance coils, repeating coils and mechanism for making temporary or passing contacts in signaling the central office. In the central office equipment, however, it is necessary to provide incoming call recording signals, differing in construction from the usual magneto exchange apparatus. The interconnecting equipments used in the central battery exchange usually remains the same as is found in magneto exchanges, with the only difference that the cord circuits must be provided with a system of circuits by means of which the centralized battery current may be passed thru the subscriber's telephone equipment. As a rule, the clearing signals provided in central battery cord circuits differ in principle of operation from those used in magneto call equipments in the respect that the caller as well as the called subscriber each and independently control their clearing signal. That is to say, the switchboard operator may determine, by observing signals provided in the answering and calling cord circuits, whether the subscriber's telephone connected to it is in its used or unused condition — that is, whether the hand telephone is removed from the switch-hook, as, for example, while talking, or whether the telephone receiver has been replaced upon the switch-hook into its normal call-receiving position. The problem of supplying battery to a cord circuit does not permit of many variations, that is, as far as the fundamental principle is concerned. Thus the battery may be placed in series with the cord circuit, or it may be placed between the two conductors, and thus projected over the circuit. However, the eight diagrams shown by Fig. 7 show more clearly in a diagrammatic form the primary methods that may be used.

Referring to the first diagram, the battery B is shown connected in series with the tip side of the A P and C P plugs. With this system of supplying battery current, it is necessary that each interconnecting circuit be provided with an individual set of batteries. That is to say, without the use of any retardation or repeating coils or condensers, the battery B can not at one time be used for more than one set of interconnecting circuits. Of course, it might appear as tho the fact of the sleeve circuit of the connecting plugs being separated from each other would not produce any ill results by connecting the W and W' wires of all cord circuits together, and for a small number

Digitized by Google

of connecting circuits this might be true, but still in that case there would be no need for using metallic circuit systems, as the common-return system would answer quite as well. However, disregarding the question of using a common battery for all of the interconnecting circuits, the second diagram shows a method by which clearing signals can be applied to the interconnecting circuit. Thus, when both of the subscribers are connected together, current from the battery B would be passing thru the clearing signal, and when either one of the interconnected parties replace their hand telephone to the switch-hook, the circuit would be open and the clearing signal produce a pre-understood signal. This system of connection possesses the objection, however, of not producing a double signal and also of "hanging up" the A P subscriber's circuit if an attempt were made to signal the central office after the C P subscriber hung up his receiver and before the operator at the central office removed the A P plug from the line jack. In order to overcome this objectionable feature, the third diagram shows the clearing signals C and C′ connected in series with the tip circuit and battery B. In this respect the system resembles that shown by the second diagram, with the exception that two clearing signals are shown. Referring to the diagram, however, it will be observed that the resistance coil R is connected to the center of the battery B and to the sleeve circuit S. Thus, when the A P plug is connected to a subscriber's telephone, current from one-half of the B battery passes over the circuit thru the C relay, causing same to attract its armature and thus produce a change from its normal position, this change being understood by the operator as indicating a responding or non-responding act on the subscriber's part. The same condition of circuits existing in the C P plug circuit, it is obviously possible to obtain what is commonly called a full supervisory system of clearing-out signals. However, systems having batteries connected in series with a cord circuit are not generally accepted as representing a practically satisfactory method of operating central battery exchanges, and the writer believes that it will be unnecessary to treat such systems at any great length.

Referring to the fourth diagram, a method is shown by which the battery B may be used for all of the cord circuits in a given exchange equipment. Thus, as shown, the battery is connected to the cord circuit thru the retardation coils R and R′. These coils must necessarily possess high retardation, particularly so by reason of the resistance being limited to the amount of current which must be passed over the A P and C P cord circuits. As a matter of fact, in a system which will be described more fully presently, it is necessary to use an excessively high voltage at B, chiefly on account of the limitations imposed by the impracticability of combining low resistance and high retardation in the coils R and R′. In other words, if a battery of low E. M. F. be placed at B, the resistance of the coils R and R′ would necessarily have to be low, and owing to the fact that the coils are incorporated into a relay construction, it was found impracticable to make them of a high enough retardation called for in the successful operation of the system. The principle of operation of course depends upon the fact that while the C P subscriber is talking, it results in varying the amount of current passing through his station, and if it will be remembered that both subscribers are receiving their current from the battery B thru the same resistance coils, it is quite obvious that the variation in the amount of current passing thru one station will result in creating a corresponding variation in the amount of current passing thru the remaining station; that is to say, if the C P telephone normally receives one-half of the current passing thru the resistance coils, which for example, we will say passes ten parts of current to the line. This leaves five parts of current for each station, and if the A P station momentarily uses six parts of current the C P station must necessarily lose a part of the current passing thru it, and it is this feature which

Digitized by Google

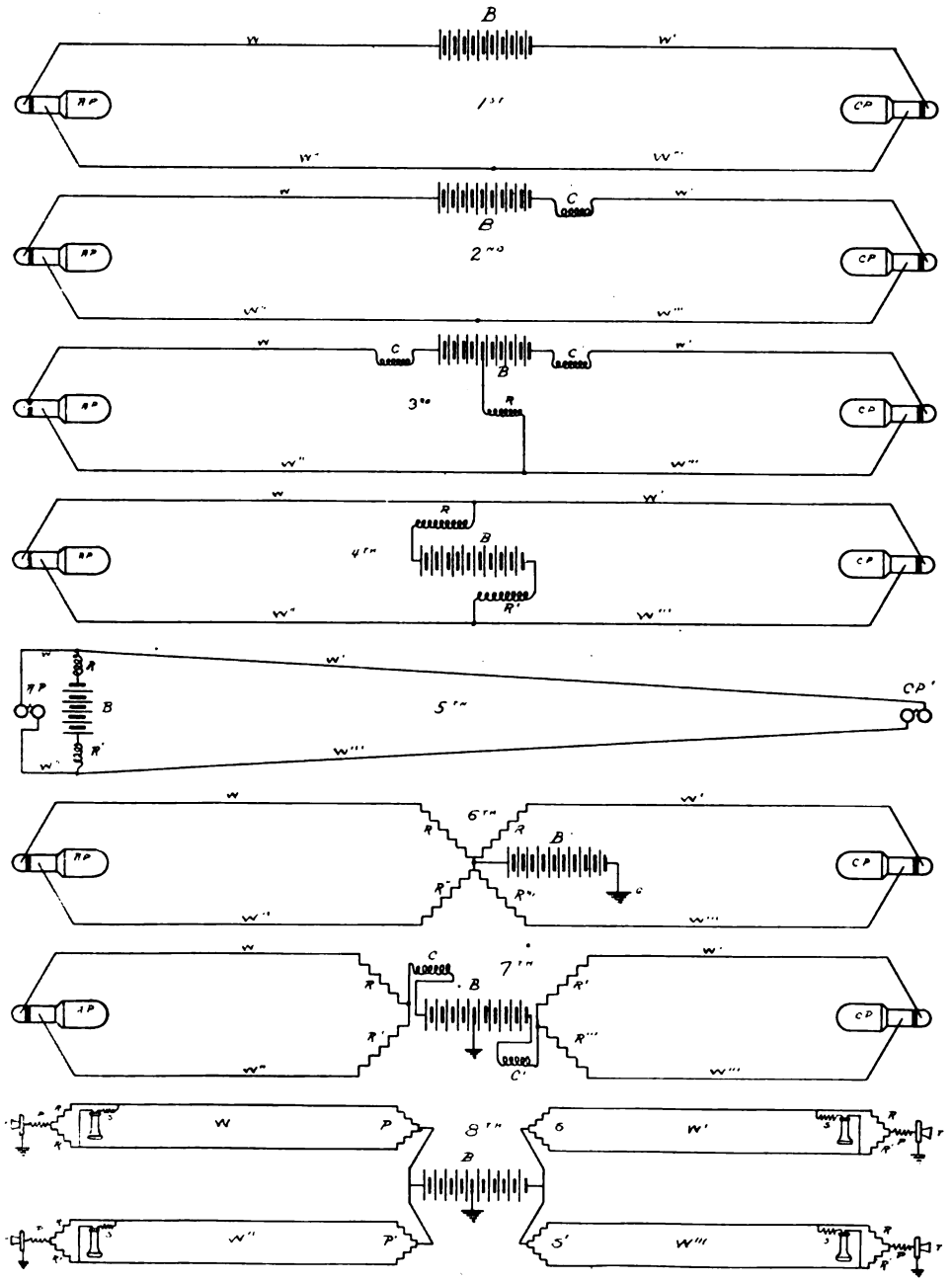
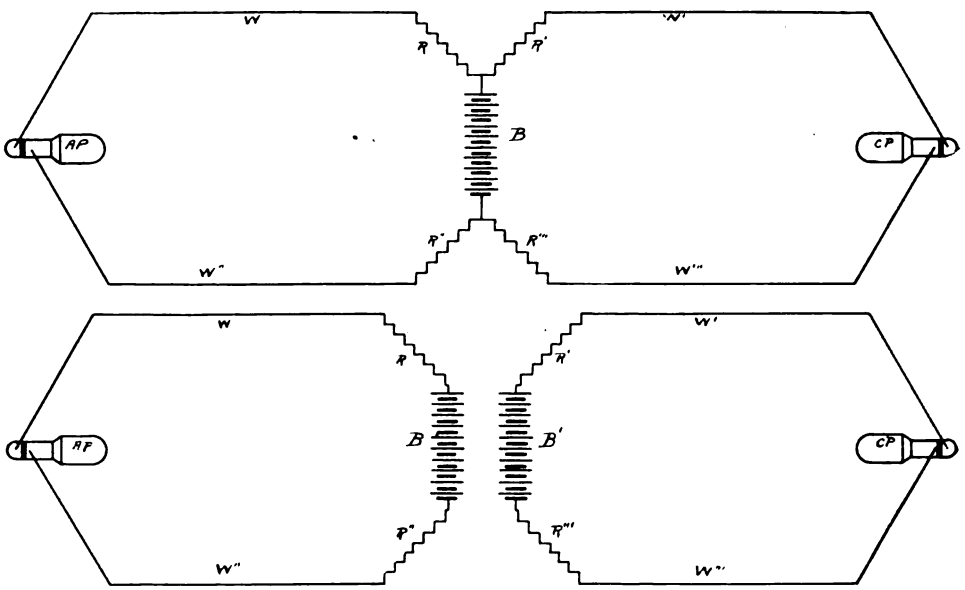



FIG. 7.

Digitized by Google

gives us the talking service. However, systems built on the above plan generally prove unsuccessful when required to give service over lines of different lengths. Thus, for example, a short line and one of low resistance connected to the A P plug might be connected together with a long and high resistance line. When this condition is present, the high resistance line is placed at a very serious disadvantage as regards the quantity of current available for its use, as the low resistance line might be taking eight parts of the available current and therefore leave but two parts available for the remaining telephone. This fact is shown quite clearly by the fifth diagram, where the A P telephone is located quite close to the central office and where the C P telephone is located at a great distance.

to the center of the repeating coil the battery B is connected and grounded as shown. The circuits of the subscribers' station instruments used in this system are shown by the eighth diagram, and the seventh diagram virtually shows the cord circuits of a system built on a modification of the above plan. As it will be observed, the A P clearing signal is shown at C and the C P clearing signal at C', the battery B being connected between the clearing signals and thus placed in a position for supplying current to the A P and C P telephones. Upon a casual examination it would appear as tho the system might operate successfully and thus permit of getting away from the objectionable features had in the fourth and fifth systems, but a more careful examination will show that the designer totally ignored or was un-




FIGS. 8 AND 9.

In order to overcome the difficulties of an unequal distribution of current between the A P and C P telephones, the repeating coil is now being used quite generally by builders of exchange apparatus. Referring to the sixth diagram, the A P and C P circuits are shown connected together inductively by means of the repeating coil R, while

acquainted with the well-known phenomena of cross-talk, for, upon examining the eighth diagram, the reader will observe that while the individual talking circuits are metallic, the battery current passing over the circuit is permitted to act upon adjacent circuits. This fact must appear obvious to every one acquainted with the operation of

Digitized by Google

common-return telephone systems, but judging by the experience which a representative telephone company had with just such a system, it appears as tho a complicated array of circuits may often be used to cover up fatal defects in the fundamental design or ignorance of the simplest telephonic phenomena.

Fig. 8 shows the universally accepted method of supplying current to the cord circuits of a central battery system. It will be observed that the repeating coils R and R′ are connected to the tips of the A and C plugs, while the R″ and R‴ windings are connected to the sleeves of the A and C plugs, and that the battery B is connected to the repeating coil in such a manner that the C cord circuit receives a predetermined amount of current independently of the C P cord circuit, which also receives its supply of current independently. A variation of this circuit, tho it differs in no respect from that shown by Fig. 8, is shown by Fig. 9. As it will be observed, two sets of batteries, B and B′, are provided, while the repeating coil windings retain their inductive relation to each other as was described before. The operation of the two systems are practically alike.

Before proceeding with the description of telephone switchboards, as applied in operating exchange systems, it will be necessary to discuss the question of clearing signals or supervisory systems for central battery cord circuits. Of course exchange systems may be designed to accommodate apparatus of a varied construction, but in all cases it is necessary to decide upon the system of clearing system before the subscriber's station apparatus as well as the general switchboard equipment is designed.

*(To be continued.)*

## A TELEPHONOGRAPH.

An interesting experiment is the combination of the phonograph and telephone, wherein the telephone message is automatically taken and recorded and answers in the same way.

The message is spoken by the person sending it into the telephone in the usual way, and the vibrations set up by the voice are caused to act upon a recording stylus by the impact of the sound waves. In this way the wax cylinder in the office of the person spoken to is indented and a phonogram is produced. This, of course, can be read off at leisure in the usual way. The vibrations are transmitted either directly or indirectly, in the latter case an electrical current effecting the object. A highly sensitive transmitter of any well-known form is used. If it is desired, the instrument may be so arranged that two wax cylinders, or phonograms, may be inscribed, the one being in the office of the sender, to be retained as a record, and the other, as an exact duplicate of the first, being produced in the office of the receiver. To effect this end the transmitting instrument has two channels or tubes for the sound waves produced by speaking into the mouthpiece. One of these channels leads to the speaking or recording diaphragm of the instrument at the transmitting station, which engraves them upon the phonogram blank. At the same time identical sound waves are electrically conveyed to the receiving instrument at the distant station of the person spoken to, and are there imprinted on another phonogram blank. It is possible to throw the phonograph action out of play and use the telephone in the ordinary way.

## DUPLEX TELEPHONY.

A duplex telephone line has been established between the cities of Yokohama and Tokio in Japan. The Government had installed two metallic-circuit lines between those cities, the capacity of which soon became inadequate for the service. In the absence of an appropriation for the establishment of a third line it was decided to duplex the existing lines. At each terminal a connection was made to the middle of the primary winding of the repeating coil of each line. The cross-connecting line was fitted with the usual telephone instruments. Thus each leg of the new third line is double, consisting of the metallic circuit of one of the other original lines. There is no cross-talk.

Digitized by Google

## TELEGRAPHS AND TELEPHONES AT THE PARIS EXHIBITION.*

BY E. J. GAVEY.

The successful universal exhibitions that have been held in Paris since the year 1878 may not inappropriately be regarded as milestones along the road of progress in telegraphic and telephonic industries, for each in its time has not only afforded unrivaled opportunities for the study of new work, but collectively they offer conclusive evidence of the value of the various discoveries or fresh departures that have been made from time to time in various fields of research, and the degree of success that has been achieved by past inventors and workers may usefully be laid to heart by those engaged in similar efforts at the present moment. Thus, for example, glancing back at the reports of the Paris Exhibition of 1878, there will be found in the list of telegraphic exhibits the Hughes type-printing, the Baudot Multiple, the Duplex, the Quadruplex, the Wheatstone, and other systems which have achieved permanent success, as is forcibly illustrated by the State telegraphic exhibits of working apparatus in the 1900 exhibition, in which they all appear as instruments in daily use. On the other hand, many apparently promising inventions which were prominent in the 1878 and in successive exhibitions have either dropped out of sight altogether or are still in the course of development; so far, at all events, as actual practical use is concerned.

Class 26 in the catalog includes telegraphs, telephones and phonographs, and I propose to deal with the sub-divisions in this order. Further, I may add that in the brief review of the exhibits in this class that I have undertaken I propose to dwell only on those which show considerable novelty, or which illustrate the progress made during the last decade, rather than to attempt an exhaustive description of the class as a whole. Under the head of telegraphs there are three distinct systems of telegraphy which deserve special mention, each exhibiting considerable merit from the scientific point of view, although possibly they may be unequal from the practical standpoint. They are designed either with a view of increasing the amount of traffic which can be carried by a telegraph circuit, or of abolishing the transcription at the receiving instruments necessary with Morse methods; but they are based on very different principles.

*Rowland's Multiplex.*—The Rowland's Telegraphic Company of Baltimore, Maryland, exhibited an apparatus of the multiplex type of working, which will admit of eight messages being sent simultaneously, four in each direction. The apparatus was at work in the exhibition, and we were told that satisfactory results had been obtained over a distance of 600 miles of actual line in America. This is so far in excess of the mileage over which we have been able to work in this country with Delany's multiplex, that a brief explanation of the principle of multiplex working generally may fitly precede a description of the new invention.

Multiplex telegraphy is based on the fact that the carrying capacity of an overhead telegraph circuit is far in excess of the speed at which a telegraphist can manipulate his key. For example, a wire which, worked by automatic Wheatstone, could dispose of 300 words per minute, if worked by hand can only carry on an average 30 words per minute. The inventors of the Delany system of Morse multiplex have therefore designed a method of increasing the carrying capacity of a wire while retaining the ordinary method of key manipulation, and based on the following general principles: Two commutators, each divided into a considerable number of separate segments, are fitted at opposite ends of a circuit. Groups of these segments are connected in proper sequence to the number of instruments to be worked simultaneously, while between each group certain segments are reserved for the maintenance of synchronism. The brushes to which the line wire is connected are caused to revolve synchronously by suitable means, and as they sweep over the segments they complete the telegraphic cir-

* Paper read at the Institution of Electrical Engineers, London, England.

Digitized by Google

cuit for a very brief interval thru three, four or six corresponding pairs of instruments manned by separate operators — first, No. 1 instrument of one terminal station being connected to No. 1 instrument of the other; next, No. 2 to No. 2, and so on. These successive connections follow one another so rapidly that, altho the initial current necessary to signal a dot or a dash in the Morse system from No. 1 instrument at one end to No. 1 instrument at the other may be interrupted four or five or six times, these interruptions are of such brief duration that they do not affect the continuity of the signal received, any tendency in that direction being counterbalanced by suitable methods. In this manner, with the Postoffice Delany system, six messages may be simultaneously in course of transmission over the same wire without the signals interfering with each other, so long as the synchronism of the revolving brushes is maintained. This being premised, if the electric current traversed the line from end to end without retardation, there would be no limit to the distance over which this method of signaling would be available. Unfortunately, however, the current is retarded between the forwarding and receiving stations, this retardation being largely due to the electrostatic capacity of the line, in combination with its resistance, and altho in practice suitable arrangements provide for a certain amount of retardation of the line current, still in practice a point is soon reached beyond which satisfactory working of the existing multiplex system becomes practically impossible, the current, say from No. 1 instrument at one end, arriving at the other end after the line has left No. 1 instrument and been connected to No. 2.

A modification of the above system, designed by Mr. Pollock, of the General Postoffice, is needed to obviate to some extent this difficulty. By an improvement in the method of synchronizing which abolishes hunting, and by dividing the commutators into two concentric series, one for transmitting and the other for receiving, and mounting them so that one series may be revolved relatively to the other by a variable adjustment, it is possible to arrange that the receiving contacts shall lag behind the transmitting ones for exactly the period taken by the current in traversing the line. This method is still under experimental trial, but it is at present only adapted for Morse signaling.

The Rowland's apparatus has the following promising characteristics:

Messages are transmitted from several sets of keyboards of the typewriting character, and any typewriting clerks should, with a little practice, be able to manipulate them. The messages are received on instruments which print them in ordinary type on a long roll of paper, which is perforated at convenient intervals to facilitate division when the received messages are printed. The electrical apparatus consists of an alternate current dynamo as the source of power from which a continuous series of electrical undulations traverse the circuit when no printing signals are being sent.

The synchronism between the receiving apparatus and the alternating currents on their arrival from the distant office is provided for by means of a small continuous-current motor, to which is rigidly geared a little alternator, both fixed on a shaft in the same axial line as the main driving shaft of the receiver. A circuit in which are two condensers alternately charged and discharged from a battery by the to-and-fro movements of the main relay tongue, actuated by the received alternations, is so connected up with the alternating motor on the receiver, that when the received undulations from the line and those due to the local alternator on the receiver are in unison, only a continuous uniform beat is heard in a telephone used as a synchronizing detector. The speed of the receiving alternator is varied by the insertion of resistance in the motor driving it until this result is arrived at. Once attained, synchronism is maintained automatically by the local alternator acting either as a dynamo or motor according as the speed of the shaft tends to advance or recede. The main driving shaft on

Digitized by Google

which the printing mechanism is mounted is revolved by a second independent motor, and by suitable adjustments of the resistance in this motor circuit the correct speed is arrived at. So long as the two shafts run with absolute uniformity a little jockey wheel connected to the first rides on a small insulated point in a disk attached to the second. If the main driving shaft lags, the jockey wheel makes a brief contact which reduces the resistance in the circuit of the driving motor, thereby increasing its speed, whereas if it advances a second contact is made which energizes an electro-magnet and establishes a magnetic break by the generation of eddy currents in a copper disk revolving between its poles. The synchronizing of the two sets of apparatus, therefore, is a relatively simple matter; and as the receiving apparatus is synchronized so as to run in unison, not with the distributing disks at the forwarding end, but with the retarded currents which arrive at the receiving end, there is no reason to doubt the possibility of working for much longer distances than is possible with the original Delany system.

Geared on to the shaft of the sending alternator is a distributing commutator with fifty-two segments, and four groups of eleven consecutive sections are connected each to a set of eleven levers actuated by the transmitting keys. The odd segments serve other purposes. A second series of four equal segments are connected each to one of the four sets of keys, and those acting on a special electro-magnet on the keyboards admit of any depressed type key actuating the corresponding levers at the right periods only. When no type keys are depressed, the alternator sends a continuous series of undulations to line, while the depression of a key by actuating two out of the eleven levers on the keyboard causes two half waves, always with a complete undulation between them, to be cut off, and this suppression of current actuates the receiving apparatus.

The receiving relay has two tongues — one, already referred to above, serving to establish and maintain synchronism; the other actuating either the printing relays or those for shifting the paper. Each of the four type receivers has eleven electro-magnets in the local circuit of the second tongue of the line relay, each electro-magnet being connected to a segment of the receiving commutator which corresponds with, and revolves in synchronism with, the main commutator on the transmitting dynamo. When no signals are being sent, the currents from the line relay pass thru the local relays in such a direction as to keep the tongues against the spacing side, but the omission of two half-waves causes the tongues of the two corresponding relays to drop over to the marking side, and this acts on the electro-magnets which print the corresponding letters, or which shift the paper, as the case may be. A revolving cylinder, with a transverse mark on the transmitting keyboards, keeps the typewriter at the far end informed of the position of the receiving roll, and advises her when to advance it vertically and shift it horizontally so as to commence a fresh line.

It is stated that each operator can send at the rate of thirty words a minute, so that with duplex arrangements a speed of 240 words should be obtained, with the advantage that the messages are detached from the receiving instrument in a condition to be sent out for delivery, without the necessity for transcription that the existing method of multiple Morse working, of course, involves.

*Mercardier.*— Monsieur Ernest Mercardier, of Paris, exhibits his multiple telegraph system, in which it is said that twenty-four messages can be simultaneously transmitted over one circuit, twelve in each direction. It is based on the harmonic system of telegraphy, one form of which was devised by Elisha Gray many years ago. Mercardier's method, however, is not a copy of Gray's, as by the use of telephone receivers and transmitters combined in various ways he has designed an absolutely independent method. Harmonic telegraphy depends on the fact that if a number of vibrating reeds, each differing by a certain defined period, say

Digitized by Google

of a musical note, be so connected that each in the course of its vibrations causes a series of currents to be sent into a line wire, the resulting current so formed consists of a series of irregular but well-defined curves, which are due to the combination of the whole series of vibrations emitted by the different reeds, just as in a musical note the sound curve is not a simple one, but is that due to the fundamental note on which are superimposed the overtones. At first sight it would appear as tho it would be impossible to dissect the combined current curves, due to the superimposed currents, into their initial undulations. In practice, however, if each of the receiving reeds or telephones, joined up at the receiving end, be tuned to exactly the same pitch as its corresponding transmitting reed at the far end, the receiving reed will respond to the current of the corresponding transmitting reed and to no other, and even tho the whole of the transmitting reeds are worked simultaneously, each being used for sending separate Morse characters, the respective receiving reeds select the Morse characters of the right note and disregard all others.

which they are tuned. The method, therefore, is a Morse method pure and simple, in which, so far as the operating is concerned, the telegraphist uses a Morse key for signaling, and the receiving telegraphist uses telephones as sounders. I learned, while in Paris, that the apparatus had, in the course of certain trials, worked satisfactorily between Paris and Bordeaux, but it requires a metallic loop for thoroly satisfactory working.

*Virag and Pollak.*— Messrs. Virag and Pollak exhibit their photoautographic telegraphic apparatus, in reference to which so much has appeared in the public press. The original system, as exhibited in the Hungarian section of the exhibition, consists of a telephonic receiver, to the center of the diaphragm of which is attached an arm which conveys the vibrations of the diaphragm to a small mirror. A spot of light falling on the mirror is reflected on to a photographic band, and when the instrument is started any movement of the mirror is photographed on the band. More signals are transmitted by an automatic method at a high rate of speed, and the record is impressed on the photographic band, in a series of

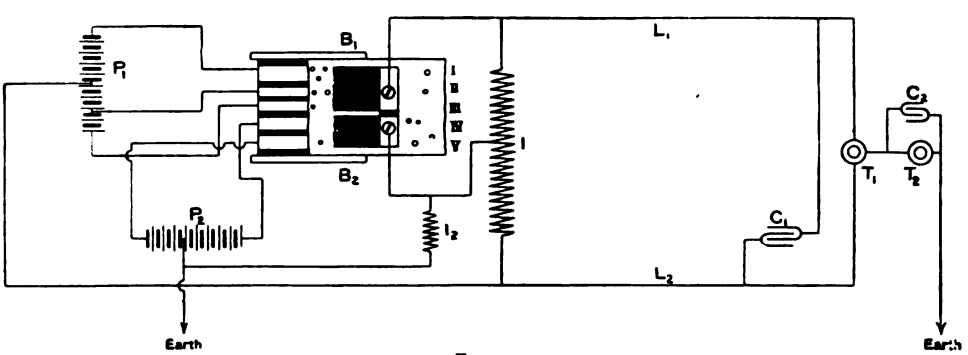



FIG. 5.

As transmitters, Mercardier uses electrical vibrating reeds of a well-known character, and as receivers he uses a combination of a telephone and a microphone, the latter sending out a powerful series of undulations into the local circuit, these undulations being selected by suitably designed telephones, which only respond to the vibrations to

curves representing the Morse alphabet. It is claimed that an abnormally high rate of speed can be attained, but the system has this disadvantage, in common with ordinary Morse methods, that the whole of the transmitted matter has to be deciphered and written out by the receiving telegraphist. During the meeting of the Electrical Congress,

Digitized by Google

held in the month of August, however, a paper was read describing a most ingenious modification of this system, by means of which the telegram is received not merely in arbitrary Morse signals, but in ordinary written characters.

In the modified system a metallic loop is employed, but it is joined up so as to form two circuits, Fig. 5, one being the ordinary metallic circuit, and the second a bridged and superimposed earth circuit of the type well known in telephony. To each of these separate electrical circuits is connected a telephone with a mounted mirror, which is vibrated by the movement of the diaphragm. These mirrors are so placed in relation to one another that a spot of light is reflected first on one, then on the other, and lastly on the photographic record. The function of one of the mirrors is to receive impulses representing the vertical component of ordinary written Latin characters, while the second mirror receives the horizontal components. The transmitting is arranged by means of a punched slip with five series of perforations; the first three transmitting currents to the vertical component mirror, and the second two to the horizontal one. The line of perforations marked I (Fig. 1), transmits a negative current of a defined voltage; row 2, a positive current of the same voltage: and row 3 a positive current of double the voltage. Rows 4 and 5 transmit thro the horizontal component telephone simple reversals.

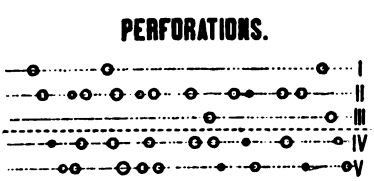


FIG. 1.

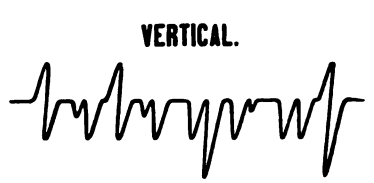


FIG. 2.

FIG. 3.

FIG. 4.

Two sizes of holes may be perforated along either of the rows, thus admitting of long or short contacts, and by means of a specially designed combination of perforations the vertical and horizontal components are so coördinated as to admit of the reproduction of written characters at the receiving end. In the diagram, Fig. 1 illustrates the perforations necessary for the transmission of the word "Telegraph"; Fig. 2 shows the vertical components; Fig. 3 the horizontal, and Fig. 4 the resultant.

TELEPHONES.

The advance in telephonic practice has, on the whole, been greater than in the branch of telegraphs devoted to the transmission of public messages. The invention and perfection of the manufacture of dry-core paper insulated cables has resulted in the more important of the telephonic administrations, both in the Old and New Worlds, undertaking the substitution of metallic for earth circuits for telephonic intercommunication. With the means at their command at an earlier period telephonic engineers were practically restricted to overhead work at their large exchanges, and altho they all realized the disadvantage of earth circuits, few of them could face with equanimity the doubling of the huge number of overhead wires necessary for metallic loops. Now a dry-core cable which will serve 200 subscribers may be drawn into a 3-inch pipe, and in the course of a few short years an earth circuit telephone will be a thing of the past. Not only has this resulted in a silent and undisturbed subscriber's circuit, but it has admitted of the introduction of improved telephones and improved switching arrangements. With an earth circuit a low-power microphone has necessarily to be used in order to diminish the

Digitized by Google

disturbance on neighboring wires, but with metallic loops improved telephones of the granular type have been generally introduced. The placing of the wires underground has likewise admitted of enlarging the number of subscribers connected to the central switches, and this has led to improved methods of automatic signaling.

There is, perhaps, one point in modern telephone work which may here be referred to with advantage, and that is the general tendency in the direction of the introduction of automatic signaling in modern exchanges. When first the postoffice opened its local exchanges in the provinces Sir William Preece insisted on the need for this method in order not only to simplify the work of the subscriber, but to insure the sending of a ring-off signal to indicate the close of a conversation. At that date automatic signaling could only be effected by the use of primary batteries at the subscriber's office, and objection was taken to the method on account of the alleged expense of these batteries. Given, however, the necessity for maintaining a couple of speaking cells at each subscriber's instrument, the extra cost involved by the addition of two or three more cells for signaling purposes was not so great as was imagined, for a considerable portion of the total maintenance cost arose from the loss of the men's time in locomotion. The principle has, however, spread, and most modern installations at present comprise some method of automatic calling and clearing signals. The diminution in the work thrown on the operator by the use of a well-designed method of signaling, which reduces the speaking to the mere words, "Number, please," "thru," or "busy," is highly advantageous in respect both of economy of working and in facility of manipulation.

*Central Battery Telephone Switches.*—A central battery automatic signaling exchange switch, exhibited by the Western Electric Company, illustrates the system that is being rapidly extended thruout the whole of the United States, and which has been adopted by the British Postoffice, in London, by the National Telephone Company in some of its centers, and by the Belgian Administration in Brussels. The system has been described recently by myself and others, and space forbids a complete technical description which would demand a separate paper for due consideration. For the purpose of discussion, however, it may be stated generally that the advantages claimed in favor of the system are broadly of the following character:

1. The generation of current in an economical manner at the central exchange for speaking and signaling purposes.

2. Uniformity in the character and volume of articulate speech owing to the speaking current being always necessarily maintained at the point of highest efficiency.

3. Economy of maintenance owing to the absence of primary batteries and the reduction of the parts liable to get out of order at the subscriber's office to the minimum.

4. A complete system of automatic signaling which reduces the need for a main relay tongue, actuated by the re-intervention of the operator, to the lowest degree.

5. The use of small glow-lamp signaling indicators which admit of each indicator being placed in immediate proximity to the jacks or cords to which the indications refer.

6. The possibility of using colored lights to indicate special rights, such as toll rates, flat rates, deposit accounts for trunk conversations, etc.

7. The use of a telephone meter for registering the number of conversations initiated by toll subscribers. This method is not necessarily confined to central energy switches.

*Postel-Vinay Switches.*—The French firm of Postel-Vinay exhibit a system recently introduced at the newest of the Paris exchanges at the Avenue Breteuil, the most striking feature of which is a remarkably small and well-designed automatic indicator, which can be placed immediately over the jack for working the junction circuits. A set of these is shown on the table, but I think that

Digitized by Google

signaling lamps are on the whole preferable to electro-magnetic indicators.

*Siemens & Halske.*— The firm of Siemens & Halske likewise exhibit a flat board of considerable capacity with certain details of signaling which are of interest. Time does not admit of a general description, but there is one point of novelty to which reference should be made — that is a combined local subscriber's jack and indicator. The call is indicated by the appearance of a small disk at the mouth of the jack. The disk is attached to the extremity of the armature of a Hughes electro-magnet. It is held in position by the magnetism of the core, is released by the reversing action of the current indicating the call, and is restored to its normal position by the mechanical insertion of the answering peg. It is, of course, again held in position by the permanent magnetism of the retaining electro-magnet.

*Party-line Telephones.*—A number of forms of party-line telephone circuits have been designed and exhibited; namely: arrangements designed to serve several offices on one circuit. These are used largely on light railways to provide communication between the headquarters and the various stations on a circuit, each being called by a step-by-step arrangement at will, without disturbing the others. The step-by-step switches which are placed at each office are actuated by battery currents of one polarity, and when these switches are in the position indicating the number of the office required, a reverse current is used for ringing up the "Wanted" subscriber. A needle on each of the dials indicates the number of the office that has been called, and by so doing it further announces the fact that the line is engaged.

There are likewise one or two automatic telephone switches which provide for subscribers to a small telephone system obtaining connection with other subscribers without the intervention of a switching operator. So far these systems have a limited use where a service designed to provide for special conditions is required.

A neat little switchboard for private use is shown by the Société par Actions du Bureau Electrique, in which connection between any two lines is effected by pressing a button which makes the necessary line contacts, and remains depressed until, on the receipt of the ring-off signal it is released by giving it a quarter revolution on its axis. It then springs back automatically into the position of rest, and restores everything to the normal condition. The use of pegs and cords is thereby dispensed with.

*Carbons for Microphones.*— The manufacture of carbon granules for microphones has received considerable attention. These appear in two forms — one the irregular granule that so far has been most generally used in this country, the other consisting of small spheres varying in size from ordinary dust-shot to one-sixteenth of an inch in diameter. There appears to be little to choose between the two forms of granules for microphone purposes.

WIRELESS TELEGRAPHY.

There are four exhibits of wireless telegraphy in the exhibition.

*Postoffice System.*— An illustration by means of coils of the postoffice electro-magnetic method originated by Sir William Preece appears in the postoffice exhibit.

*Ducretet and Popoff.*— Monsieur Ducretet exhibits his Hertzian system,

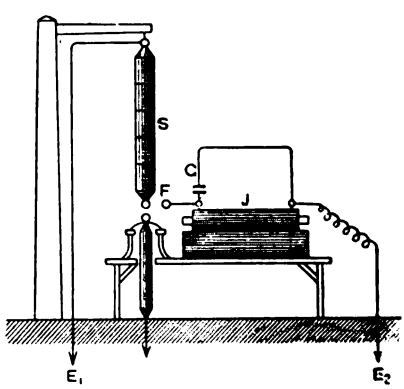



FIG. 6.

which it is understood he designed in conjunction with Monsieur Popoff, the Russian inventor, and which has been adopted in the French navy and, it is

Digitized by Google

believed, in the Dutch. There was nothing to specially distinguish it from the Marconi system in this country.

*Slaby and D'Arco.*—The Allgemeine Elektricitats Gesellschaft exhibits a system designed by Slaby and D'Arco in Berlin, and this deserves a little consideration, as the inventors have replaced the usual vertical insulated wire, so well known in connection with wireless systems in this country, by a vertical cage, the upper end of which is connected to earth. This is illustrated in Fig. 6. At first sight it would appear as if the effect of the cage would to some extent be neutralized by the waves emanating from the return wire to earth, but probably the self-induction of the earth wire practically confines the oscillations to the cage. This, however, is an interesting subject for speculation and investigation.

The American Wireless Telegraph Company exhibits a system in which a pneumatic arrangement has been designed for decohering, the object being to reduce the number of relays and magnets in the combination, with a consequent diminution of the local Hertzian waves which tend to interfere with accurate reception.

*Poulsen Microphonograph.*—Perhaps the invention of the greatest scientific interest is the Poulsen microphonograph, by which a telephone conversation can be permanently recorded on a steel wire, and reproduced at any time. In this apparatus a steel wire, or a steel band, is moved by any suitable means with considerable velocity between the poles of a small electro-magnet. On speaking into a telephone transmitter joined on the circuit, the undulatory currents set up in the transmitter react upon the electro-magnet, and cause a continuous variation in the direction and in the degree of magnetism at the poles of the electro-magnet. These variations are permanently recorded on the steel wire as it rushes by, and when the message is complete the steel wire retains a definite record of what has taken place in the shape of a continuous series of transversed magnetized lines varying thruout in their polarity and in their strength. On connecting a telephone receiver to the electro-magnet, and again starting the wire on its course, this magnetized wire generates electric currents in the coils of the superimposed magnet as it passes between its poles, and these electric currents, which are the exact counterpart of those generated by the original voice, cause the telephone to repeat what was said in an almost absolutely perfect manner. In one variation of the instrument an endless steel band was caused to revolve at a high rate of speed around two wheels which stretched it out to its full extent. On one portion of the band was placed a magnet connected with a microphone; further on were half a dozen electro-magnets connected with as many telephones; and finally an electro-magnet thru which circulated a permanent current. As the band rushed by in the course of its revolutions it picked up the magnetism from the speaking microphone circuit, next it reacted on the electro-magnets connected to the telephones and caused them to speak, and, finally, on passing under the electro-magnet thru which a steady current was flowing, the whole of the impressed magnetism was neutralized and the band wiped clean, so to speak, and rendered ready to receive a fresh impression.

At present this invention is in the early stage of scientific discovery. It may be used by a telephone subscriber to record an important communication, and it promises to afford means of obtaining a telephone repeater, a problem which has been before the electrical world for the last twelve years, and which so far has not been solved in a satisfactory manner. A telephone repeater would increase the range of telephonic speech and decrease the cost of long lines. The president of one of the American telephone companies some time ago publicly offered a reward of $1,000,000 for a thoroly satisfactory telephone repeater, but the money has not yet been earned.

*Telephone Hirmondo.*—Among the miscellaneous exhibits is one by the "Telephone Hirmondo," which provides news and musical transmission alone, but without telephone intercom-

Digitized by Google

munication, in the city of Buda Pesth. Technically there is very little information to be derived from the exhibit, which is rather statistical than technical, but I was rather surprised to learn that the number of subscribers to the system had increased from 3,750 on January 1, 1895, to 7,560 on January 1, 1900, all the wires being overhead. In practice items of news are spoken into the main transmitting telephones at the central station every quarter of an hour, and such items are repeated until a fresh batch is started. So far it is an electrical substitute for an evening paper combined with a theatrophone installation.

I came across a novelty in telephone administration. In the capital of Mexico they have absolutely free trade in telephone exchanges, which may be erected by any body or company with the sole proviso that there must be intercommunication between the systems. There are eight separate companies at work, with an aggregate of 4,000 subscribers, the average rate of payment being 12½ f. per subscriber per month.

At the meeting of the Electrical Congress various papers were read which have been or will be published. A committee was likewise formed to consider the question of units, and some radical proposals were brought forward, which would have involved an entire change in the existing methods of electrical measurement. The whole subject was very keenly debated, and anything in the nature of a radical alteration was outvoted. The committee restricted itself to giving definite names to two of the existing units, which up to the present had been known as the "C.G.S. unit of magnetic field," and the "C.G.S. unit of magnetic flux." These propositions were then submitted to a meeting of the official delegates, and were practically carried unanimously. A further proposition was submitted to the delegates to the effect that electrical energy was property, and that its theft should be punishable by law. This was also carried. In Great Britain existing Acts of Parliament define electrical energy and provide against its theft, but in certain countries it has been argued that electricity can not be weighed, and that no punishment can be inflicted for stealing it, hence the above resolution.

In the foregoing curtailed review it is, of course, impossible even to refer to many of the excellent exhibits of working apparatus, line stores, cable exhibits, and other modern and up-to-date telegraphic and telephonic materials and appliances that were to be seen at the exhibition. If I have had occasion to omit even a casual reference to many beautiful and elaborate exhibits, this was not due to want of appreciation, but to the fact that to do justice to all would involve a complete treatise on telegraphs and telephones. It is hoped that the few remarks I have made on the most striking developments will be of sufficient interest to have justified the presentation of this paper.

## COMPARATIVE FRENCH TELEPHONE STATISTICS.

The following figures show the development of the telephone service in France: Subscribers, in 1880, 479; 1889, 6,401; 1894, 13,168, and 1899, 24,468. From 1891 to 1899 the number of call stations went from 10,992 to 28,673; and the messages from 30,865,000 to 111,900,000. On August 31, 1899, the State assumed control of the telephone system in Paris and cut down the subscription from $120 to $80. Private societies still control the telephone service of Algeria, Bordeaux, Calais, Havre, Lyons, Marseilles, Nantes, Oran, Rouen and St. Etienne, where there are 2,429 subscribers, which is at the rate of one for every 736 inhabitants.

## LONDON, ENGLAND, RATES.

London, England, has arrived at the American scale of telephone rates. For a telephone covering the entire municipal system the charge will average $50 per year. District telephones proportionately less. The toll service, which bids fair to be the most popular plan, is $14 per year and 2 cents for each call. A successful double-recording meter is in demand.

Digitized by Google

# Telephone Magazine

THE ONLY INDEPENDENT TELEPHONE PAPER IN THE WORLD.

MARQUETTE BUILDING,

TEL. CENTRAL 2641. CHICAGO.

Published on the 1st day of each month.

**Electrical Engineering Publishing Co.**

JOHN C. McMYNN, PRESIDENT.

**SUBSCRIPTION:**

One year, United States and Canada..... $1.00
One year, foreign countries ..... 1.50
Single copies..... .10



**COPYRIGHT:**

The title and contents of this paper are covered by a general copyright. Permission from publishers must be obtained before any article or table is copied, or any illustration reproduced.


**CHICAGO, DECEMBER 10, 1900.**

THE closing of the Paris Exhibition on November 12 brings to issue widely diverging opinions on its success or failure.

Financially, the bondholders, the unlucky concessionaires, and the gallery exhibitors are likely to receive nothing but thanks for their expenditures. Even this un-American appreciation has been lacking in this display of the world's progress.

From an engineering point of view, however, the Paris Exposition is a great success. The display of electrical development has proved a wonderful educator even to the real expert, while to the student it represents the equivalent of years of ordinary study.

American telephone firms have not all taken advantage of the great facilities offered by this big show, due perhaps to the large volume of business they are doing, but many have taken advantage of the unique opportunity to see the competition offered by the markets of the world.

While the exhibit of American telephone devices compares favorably beyond question with that of other countries, the close observer could not but appreciate that foreign manufacturers apply the business policy of "Not how cheap, but how good," to the manufacture of their product, and the results of the Paris Exhibition can not fail to give an incentive to the American manufacturer to maintain prices. Cheap prices produce cheap devices and the successful American manufacturer will be the one who gives a higher value of product and not a lower value in price.

---

THE absorption of the American Bell Telephone Company by the American Telephone & Telegraph Company, and the selection of a new president to fill the vacancy caused by the death of John E. Hudson will doubtless effect a change in the business methods of the American Bell Company.

It may be said on the best obtainable authority that the names under consideration by the board of directors for the office of president are: C. F. Cutler, president of the New York Telephone Company; John I. Sabin, president of the Pacific Coast Telephone Company, whose recent presence in Boston has, it is intimated, had to do with this matter; Charles J. Glidden, president of the Erie Telegraph & Telephone Company, and vice-president and general manager E. J. Hall, of the Long Distance Company. All of these gentlemen have had a long experience in the telephone business, and one of them could fill the position of chief executive officer of the American Company in a most acceptable manner.

They represent the best operative managers of this country. Does this

Digitized by Google

mean that the future policy of the company will be the extension of their legitimate business and not the vindictive pursuit of their patent litigation? Or can it be possible that they now acknowledge the strength and development of the independent business?

The selection of any one of the four gentlemen mentioned for president would indicate that the financial and operative details will receive paramount attention, and that the expiration of the patents covering the fundamental principles of telephony is likely to change a policy that has for years been a glowering monument of expensive selfishness.

---

THE National Telephone Company, of London, England, has notified its subscribers of an intimation from the postoffice that a minimum of twenty minutes must always elapse before any reply can be expected by a subscriber as to whether he can get thru to the town on the trunk service with which he wishes to communicate. The delay is attributed to an insufficiency of trunk lines and a paucity of operators, but wouldn't that excuse in the American exchange "hang you up?"

---

SHALL Galesburg, Illinois, have another telephone system? The city council has had before it for several months the request of a new company to be granted a franchise for a new plant. The new company stands ready to expend $100,000 on the plant here if necessary; it will put in a modern system with the latest improvements; in the business center of the city and where necessary it will run the wires thru underground conduits; it will give the citizens telephone service at much cheaper rates than at present; it will instantly put the city in connection with 3,000 to 4,000 telephones with which there is now no exchange connection, and it will make Galesburg the central telephone system for a large scope of country. More than this, this new system will enable the business men to have connection with a large stretch of farming community, from which they are now shut off. It is a fact worth considering in this connection that farmers are awakening to the advantages of the telephone, and the town which gets into telephone communication with them gets their trade.

So in the present case friendliness for a competing telephone system does not mean hostility to the Central Union. It simply means that the people should be allowed to reap the benefits of competition in what is a fair and legitimate business field.

The promoters can not make traffic arrangements with the Central Union. If they could do this, then citizens could avail themselves of this great system of telephones, from the use of which they are now excluded.

When a company comes along and offers to give telephone service twenty-five to fifty per cent cheaper than the existing company, it is the duty of the council to give the people a chance to enjoy the benefits of such lower rate. A refusal to grant the new franchise is simply saying to the people that they must go on paying the prices established by the Central Union. It is giving other cities an advantage over Galesburg.

It is not believed that the city council will refuse to grant this franchise. The committee having the franchise in charge will find it hard to give any reason for reporting against a franchise that promises cheaper telephone service, modern equipment, and large communications.

Digitized by Google

DOWN in Norfolk, Virginia, there is an editor who runs a newspaper called the *Pilot*. He is not only a bright editor, but his writings betray an exceptional knowledge of the Southern telephone situation. Commenting upon the action of the city council in favoring the Bell Company he says in part:

"In the course of an impartial canvass our reporters were able to find but twenty-six men in the city of Norfolk who would not express themselves as in favor of amending the Bell Telephone Company's franchise by fixing in it the same maximum rates now in the Southern States franchise. The facts in the case, the ordinances of the city, the public interest, and every consideration of fairness demanded that this should be done — that in its corporate capacity this city should treat every man and every corporation alike; that it should know no distinction in the concession of public utilities. And yet, with a practically unanimous public sentiment in favor of this proposed amendment, with a full knowledge that they were betraying the interests of their constituents, stultifying themselves, and repudiating one of the city's deliberately incurred obligations, twenty members of the city council surrendered bag and baggage to the demands of the Bell Telephone Company.

"WHEN A PUBLIC SERVANT LOSES A WHOLESOME REGARD FOR PUBLIC OPINION, HE BECOMES A MENACE TO EVERY INTEREST COMMITTED TO HIS KEEPING. Is public sentiment impotent? It will speak, and to the purpose."

These are strong words, well expressed, and we not only hope, but believe, that he will win out in the fight against the Bell.

THE list of late consolidations of the Bell companies given in this issue only means that there will be a formal recognition of relations that already exist. A majority of the stock in all the hundred and more systems operated by the Bell people is owned by the same persons, and the proposed consolidation will merely simplify the management by making the managers of the several systems responsible to the American Bell managers instead of directly to the stockholders of the several stock companies, under various names, belonging to the American Bell Company. The advantages of competition and the success of Independent companies, run on business principles, will still operate to raise up rival companies, wherever the Bell Company attempts to enforce a schedule of extortionate rates. This the Bell Company realizes and hence its efforts to thrive thru the favoritism of legislatures.

As an illustration of the advantages of efficient telephone competition we cite a few figures to show that an Independent company, giving good service, can always command patronage despite the rate-cutting of the Bell.

The old Bell rates at Detroit, Michigan, were $72 and $50, supporting 4,000 'phones. This rate was cut to $36 and $24. The new company's rates are $40 and $25, and support 5,200 'phones. The Bell, at Grand Rapids, formerly charged $72 and $60, with 1,300 'phones; cut rate $30 and $18. The new company has 3,100 'phones, more than double, and gets $36 and $24. The Bell, at Trenton, New Jersey, had a flat rate of $60, with 400 'phones. The competition rate is now $36 and $12, but the new company has 800 'phones, at $36 and $24. Fort Wayne, Indiana, with 527 'phones, formerly paid Bell prices of $72 and $48. The new company now has 1,600 'phones at $36 and $24. The Bell prices at Des Moines,

Digitized by Google

Iowa, with 735 'phones, were cut from $72 and $60 to $36 and $12. The new company has 1,200 'phones now running. Fayette, Indiana, supported 400 Bell 'phones at $48 and $36, and notwithstanding the cut to $18 and $12, the new company has 800 'phones at $30 and $18. Toledo, Ohio, furnishes one of the biggest gains. The Bell had 452 'phones at $72. The new company at a rate of $54 and $24 has 2,200 subscribers.

Many other instances could be quoted, but the figures show that Bell rate-cutting to kill competition does not kill.

---

THE remarkable interest taken in the reports of experiments in wireless telephony indicates an equal interest in the late developments in wireless telegraphy, now making giant strides in practicability, closely followed by the nimble feet of the wireless telephone. Marconi has permitted a member of his electrical company to promise:

"By reasonable calculation we will have America and Great Britain upon speaking terms before Christmas of the new century.

"Wires will be used, one on either end, about two hundred feet long and by an apparatus whereby the air waves will be lengthened to an almost unlimited extent. The sound waves will travel close to the surface of the ocean, the whole distance, thus circumventing the dreaded difficulty presented by the curvature of the earth. Masts erected at Southampton and Long Island need not be higher than the roof of a New York skyscraper."

A knowledge of the wonderful accomplishments in the wireless transmission of signals during the past six months would seem to make the fulfillment of this promise a reasonable prophesy.

WHEN the Kentucky Telephone Association of Independent exchanges was formed it was anticipated that the obviously desirable mutual protective and toll line exchange combination would stick, but one link in the chain was susceptible and the people operating the Paris exchange sold out to the Bell. This act on the part of the Parisites, as they were promptly named, was uncultured, mercenary and unexpected. Besides, it annoyed the rest of the good people who stuck; they may have to build a new exchange at Paris; so an agreement not to sell to any other company has been signed by the following companies: Green River Valley, Nicholasville, Danville, Williamstown, Owenton, Lebanon, Louisville, Lexington and Stanford, Fayette of Lexington, Cynthiana, Frankfort, Georgetown, Winchester, Old Kentucky, Crab Orchard, Maysville, Lancaster, Somerset, Winchester and Lexington, Citizens' of Newport, Louisville Home, Lawrenceburg, Houstonville and the few remaining exchanges say they will do so. Similar State associations might go still farther when organizing, and a working agreement covering a money forfeiture is about the best ounce of prevention they could adopt. Some people are so constructed that the only emotion which governs their doings is a mercenary one, and they might even own a telephone exchange.

---

THE vast amount of cement employed in English engineering practice is as noticeable as the constantly increasing specifications for this article in the work of American engineers. Nineteen large cement works have been built in this country during this year and four more are in erection, and yet it is not likely that the supply of cement will exceed the demand.

Digitized by Google

# TALKS AND CROSS-TALKS.

BY A. E. DOBBS.

HINTS TO CORRESPONDENTS.

Write on one side of the paper only, and make sketch or diagram, when necessary. Endeavor to give all the facts bearing on the case, so as to enable the editor to answer intelligently.

Name and address must accompany each letter, not for publication, but for the information of the publisher.

## COUNTRY LINES.

How and on what terms to connect city exchanges with the country districts is a problem that is just now troubling quite a few managers, and the question is so many sided and is surrounded by so many different conditions that no fixed rules are at all practicable.

But as the question is very much alive, and we have to deal with it, and deal with it right away, a few hints based on both experience and observation may be of benefit to some of our friends who are just entering this field.

Farmers are beginning to realize the necessity and convenience of telephone connections with their nearest town, while it also follows that the importance of the exchange is increased by having the widest possible territorial connections.

Expansion does pay in the telephone business, provided proper business sense is used. Farmers, as a class, are not prodigal in the matter of expenditure, and will not pay enough to justify anything else than some form of party-line system, even tho the perfect party line has not as yet, to the writer's knowledge, been invented.

But there are other matters to be considered first. Let us divide the various conditions into classes, as follows:

### FIRST CONDITION.

A community of farmers have clubbed together, built a few lines, having perhaps twenty or thirty connections for their own convenience, and now demand connection with the town exchange, accompanied with an offer of little or no consideration in return.

*Remarks:* You can not well afford to treat these people as you would another exchange unless you could make traffic arrangements with them and charge for each connection. The chances are that these lines are in poor condition, perhaps equipped with the cheapest wire they could buy, full of bad connections, hung up in trees or on unpeeled poles that will not last two years, poor insulation generally, and to crown all, overloaded with instruments procured thru some department store.

It is difficult enough to get the average small exchange to put up half-way good construction, even tho they generally have at least one or two linemen who should know how to do the work. How, then, could it be expected that farm hands would comprehend it?

Neither could these people be depended upon to keep their lines in repair, as they nearly always agree to take turns "chasing trouble," and there is always an argument as to whose turn it is to go out, with the result that nobody goes for several days. It also goes without saying that, tho a farm hand may possess a high degree of intelligence, that of itself does not qualify him to be either a good lineman or competent instrument man.

*Conclusion:* Exchange managers can not afford to have anything to do with a proposition of this kind unless they can control it, as their own exchange will get all the blame for the poor service which will be sure to follow.

If the instruments are good, which may happen to be the case, and the lines in fairly good condition, place a value upon them, give them exchange stock, or cash, for their plant and run it yourself. If, on the other hand, neither instruments nor lines are in good condition, have nothing to do with them

Digitized by Google

unless their owners will make it worth your while to put in standard instruments and rebuild their lines. Charge them all a fair rental for their service, treat them all alike and then, when improvements are needed, make them without let or hindrance. The fact that they are stockholders in the exchange will make time contracts unnecessary. If an arrangement can not be made on this basis, put in a toll board and charge for all connections.

SECOND CONDITION.

Giving each country subscriber a separate line.

*Remarks:* If there are twenty or thirty subscribers scattered out over, let us say, 15 miles of country road, and only grounded lines are used, the cost would average at least, if properly constructed, about $150 per mile, while metallic circuits would cost considerably more as well as add to the trouble account.

In estimating a rate for a line of this kind it is well to keep in mind that a line that does not make a net earning, above cost and repair, of at least twenty per cent, is apt to be losing money for its owners; for out of this twenty per cent must be figured ten per cent for depreciation—but few plants last longer than ten years — which leaves but ten per cent for earnings and possible accidents. Again, this number of grounded lines running side by side for the distance mentioned can not escape considerable cross-talk, while, as before explained, metallic circuits increase the cost.

*Conclusion:* If your country friend feels that a private line is necessary to his happiness, charge him enough to make it worth your while to do business with him; he will respect you just as much for it.

THIRD CONDITION.

A plan very successful in many places is the club or party line, by which the exchange agrees to furnish metallic circuit lines on condition that a certain number of subscribers (generally from five to ten) will sign a three years' contract at a rate slightly in advance of that paid by town residences, the rate increasing with the distance from town.

*Remarks:* This is probably the most satisfactory all-round arrangement that can be made under present conditions, even tho the perfect party-line instrument has not, as yet, to the writer's knowledge, been brought out, yet it combines a reliable and fairly good service with low cost and cheap maintenance.

*Conclusion:* Try to secure people for these groups mutually agreeable to each other, for one meddlesome, eavesdropping neighbor can make trouble all around and perhaps be the cause of turning away several others. Secure them with a three years' contract if possible, altho, if the service is reliable, you will hardly lose them in any event.

FOURTH CONDITION.

In this case the patrons at more than, say, five miles from town are divided into groups of, perhaps, fifteen or twenty, with from three to six on each branch line. These lines may be grounded, or metallic-shunted series, or bridged, or if subscribers are close enough together, each one may have a separate line all to himself.

Three or four of these leads are then brought together at one common center, where a small exchange does the switching, as at some country postoffice or farmhouse, where it is reasonably certain that some one will always be at home to attend to it.

*Remarks:* In Fig. 1 is shown connections for three groups of subscribers, marked as stations No. 1, No. 2 and No. 3, of which No. 2 has three party lines shown. Party lines enable these people to do a great deal of talking to each other without disturbing the attendant, or in any way interfering with the trunk line, but when they want to talk to the exchange they will, of course, have to call the attendant to make the connection.

Fig. 2 shows the best method of connecting this station without going into unnecessary details.

The station bell *B* is bridged on the exchange line, the cord and plug — which, in cases of this kind, are generally connected to the subscriber's line direct — making connection to the trunk

Digitized by Google

line thru the open jack *J*. A ring-off drop, or bell, is generally left in the cord

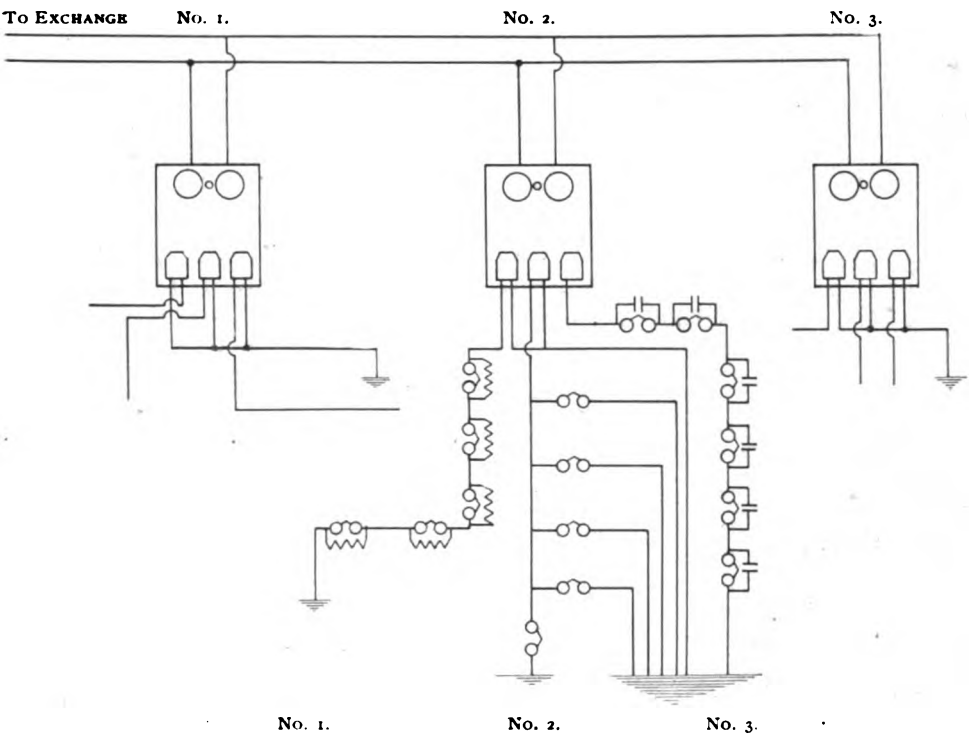



FIG. 1.

circuit or line, while a repeating coil *C* breaks direct connection between the grounded and metallic-circuit lines.

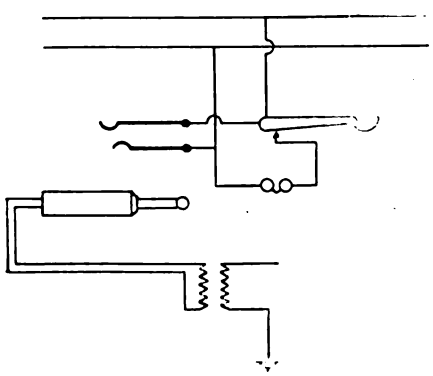


FIG. 2.

Returning now to Fig. 1 and referring to line No. 1, station No. 2, it will be noticed that there is an auxiliary coil or shunt *s, s, s, s*, around the ringers. This shunt should have a resistance equal to about three or four times that of the ringers, this having been found by actual experience to give good results. Of course, this shunt should be a non-inductive resistance, which may be attained by winding a small spool of german silver wire doubled back upon itself, as in

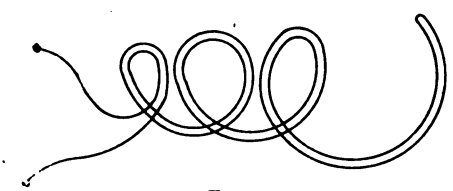


FIG. 3.

Fig. 3, or it might be a graphite rod, which has been found very satisfactory in some cases. It should be shunted across the bell circuit as shown in Fig. 4, so that it may be cut out of circuit when the hook comes up. In line No. 3, same station, is shown a condenser shunt which is also very efficient but rather

Digitized by Google

more delicate to static discharges. The reason for the use of this shunt on series lines is that, while the measured resistance of the ringer coils to a direct current is, say, 80 ohms, the resistance to alternating currents, even those of the low frequency of a generator, is considerably higher, while to telephone currents which vibrate hundreds and even thousands of times a second the resistance runs up to many hundred ohms, caused by the presence of the iron core in the circuit (tho there would still be some self-induction even if the iron core were removed), which not only opposes the passage of the telephonic current but

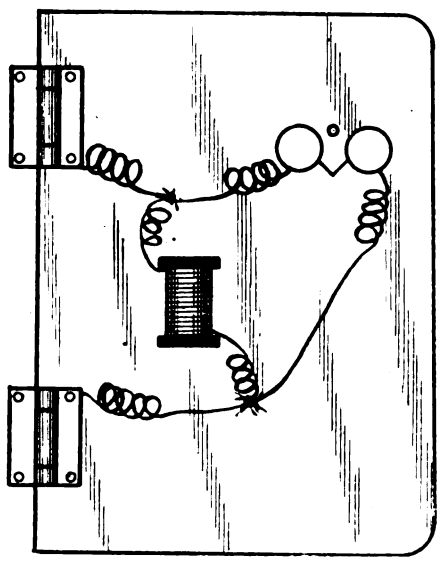


FIG. 4.

distorts the waves until they can not readily be recognized.

Some of our friends do not approve of series 'phones on party lines, and while the writer has no quarrel with those who prefer bridged instruments, he begs leave to say that on the average country line one class would give as good service as the other, especially in view of the fact that ground rods in the country are a very uncertain quantity. Again, there is considerable difference in the first cost of the instruments, tho that will often be more than made up in the extra wire required to run a loop for the series 'phone. In order to meet the demand for bridged instruments for lines of this kind, manufacturers are continually increasing the size of their generators, till some of them give out almost current strength enough to drive a fan motor. They are also proportionately heavy to handle.

Now all these remarks about series instruments are intended to apply only to grounded lines, tho even in a metallic circuit of high resistance they might be an advantage. Farmers do not, as a rule, require long-distance service. If their 'phone does business up to one hundred miles it is all they have a right to expect, and a good grounded line will do this; provided, of course, that there is no interference from foreign currents. One thing should not be forgotten, namely, that a man who does not know how to do these things may make a failure of any system and that telephone engineering consists in a thoro familiarity with apparatus and conditions and meeting them properly.

### FIFTH CLASS.

There is still another class of service lately introduced which suggests possibilities in the way of country service to which it might pay to turn attention, namely, a district messenger telephone or one-way service. In this system the battery, consisting of twenty or thirty gravity cells, is located at the central office, while the calling device may be the ordinary break wheel used in district messenger boxes.

*Remarks:* The circuit may be closed thru the boxes in series, or, the boxes may be bridged to ground, with the break wheel normally open, and to be closed only when signaling or talking. Of course the signal could be sent in by simply removing the receiver from the hook, but the break wheel enables "central" to tell who is calling in.

Each call being registered, it would have a tendency to prevent eavesdropping. Some sort of a non-interfering device on these boxes would also be desirable.

This system is not equipped with bells so that it can only be used for calling into town, which is all some farmers want.

Digitized by Google

On a cheap rental basis, twenty or thirty subscribers could be connected to one circuit, or with a coin-operated mechanism attached and charged up at the rate of say, 5 cents a call. Or, if preferred, connect up a paper register to the office relay, file these calls away and settle monthly. No doubt there are many communities where such a system would add materially to the revenues of the exchange.

A one-way call will soon lead up to a demand for regular telephone connection. As the instruments consist of a very few parts they should be quite low in first cost.

GENERAL REMARKS.

There is a demand for a party-line instrument adapted for this class of work which should contain the following points:

1. It should be selective signaling, so that any subscriber could be called without disturbing the others.
2. It should not require the use of more than two wires.
3. If possible, one instrument in use should lock out all the rest.
4. It should be able to take care of ten instruments or signaling stations.
5. It should be a step-by-step system. Strength and polarity systems are only reliable for a small number of signals.
6. Its cost should not be greatly in excess of those in common use.
7. It should keep clear of existing patents.
8. It should be reliable at all times and in all conditions of weather.

It will thus be seen that the task laid out for inventors is not an easy one, and for the information of our readers it may be stated that inventors have been working on these ideas for about twenty-two years.

## THE TELEPHONE RECEIVER APPLIED TO WIRELESS TELEGRAPHY.

M. Henri De Bergé, writing us from Paris, gives an interesting description of the experiments of M. Guarini in utilizing an ordinary telephone receiver in connection with a telegraph key, which, briefly, is as follows:

A current of 4 amperes and 17 volts from a battery of eight accumulators is sent thru the primary of an induction coil having a vibrating contact-breaker.

The secondary circuit of the coil gave a 2-inch spark across the discharge terminals. In the present experiment a telegraph key of the Morse pattern was used for sending and the secondary terminals were brass knobs. Charging a Righi oscillator which was provided with balls of diameter of four inches, and placed about one twenty-fifth of an inch apart.

Fig. 1 shows a single insulated copper wire connecting one of the knobs

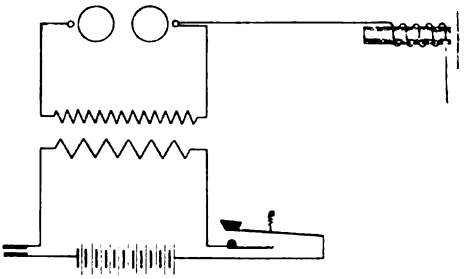


FIG. 1.

8 with the telephone 12, leaving the other telephone wire 13 disconnected and simply hanging. This leaves the telephone on a perfectly open circuit, and when Morse signals were sent by Key 1, they were easily translated by the person at the telephone receiver.

The conclusion premised by M. Guarini is, that Hertzian currents produce magnetization of the telephone receiver pole-piece as readily as ordinary currents; and that it is possible by means of Hertzian waves to communicate on a single wire, without earth or other return.

On test a condenser was connected between the telephone and the knob of the coil, which gave an immediate improvement on the clearness of the signals, showing that the interposition of a condenser in the air-wire might improve the transmission of signals in ordinary wireless telegraphy.

The condenser was next connected to the free telephone wire as shown in Fig. 2, which rendered the signals still more distinct.

Digitized by Google

A third test was made by combining the above two experiments, using two condensers, which produced signals still louder and clearer.

In the fourth test the condenser was placed across the knobs, which have been placed in contact with the corresponding balls of the oscillator, and the more this contact was increased, the louder the signals were transmitted in the telephone.

In the fifth test the induction coil was connected to earth, leaving the second telephone terminal free. The result gave the signals as loudly and clearly as before, but showed no improvement.

In the sixth test the knob connected to the telephone was thoroly grounded, the other knob of the coil being free. As anticipated, there was practically no

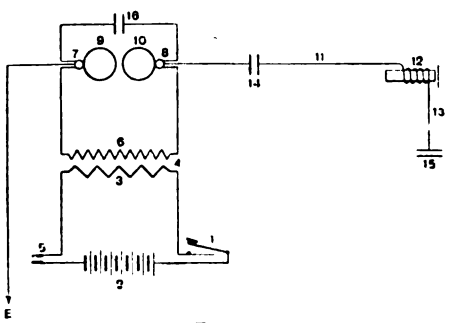



FIG. 2.

sound heard in the telephone receiver, and M. Guarini's conclusion is that the experiment simply proves that most of the energy is radiated from the knob having the greatest variation of potential.

The seventh experiment, combining the condition of tests 4 and 5, showed grounding one knob of the coil is of little benefit when there is a condenser across the spark gap of the coil.

By combining the conditions of tests 3, 4 and 5, and adjusting the condensers, a very powerful effect was produced and for the first time the ear required protection by being insulated from the telephone. This test, M. Guarini suggests, demonstrates that the proper use of condensers would lead to a great increase in the possible distance over which signals may be transmitted without wires.

In Fig. 3 M. Guarini interrupts the lead going to the telephone by a transformer, and he finds that the oscillations are very perfectly transformed.

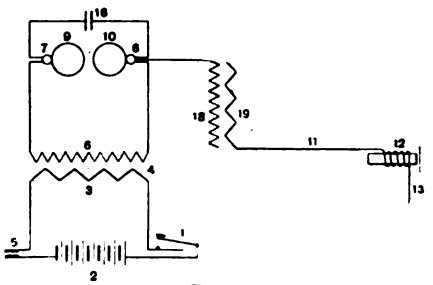



FIG. 3.

He next carefully repeated the preceding experiments when all the sending apparatus was enclosed in a metal box, and found that the signals were exactly as in previous tests.

M. Guarini has further performed a similar series of experiments, shown in Fig. 4, wherein there is no conducting communication between the sender and the receiver. He utilizes horizontal air-waves nearly ten feet long and worked with a distance of several yards between them. At first the telephone terminal not connected to the receiving air-wave was free, but later was

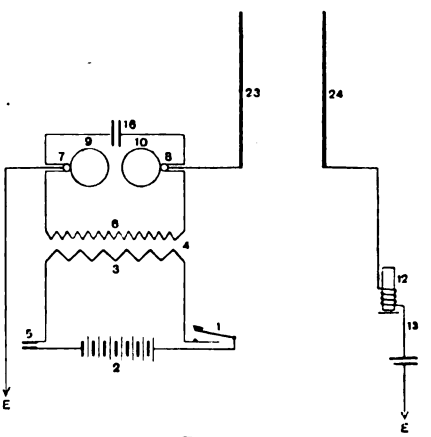



FIG. 4.

connected to one side of a condenser, by which the signals were improved. This condenser then had its free

Digitized by Google

terminal grounded while the free knob of the induction coil was also earthed; and M. Guarini deduces that by this last mode of connecting signals could be easily transmitted from ten to twenty miles by using air-waves of 180 feet in length.

New experiments will be made with a double-receiving diaphragm, which will definitely determine the limit of distance thru which signals can be projected thru air-waves on the lines indicated in the foregoing tests, which may and probably will take some time.

## JAPAN TO ADOPT AMERICAN TELEPHONES.

DR. IGARASHI, IMPERIAL DIRECTOR OF TELEPHONES, IS HERE LOOKING UP NEW DEVICES.

Dr. H. Igarashi, director of the imperial telephone service of Tokio and Yokohama, Japan, who has been in the city for two or three days investigating the service of the local companies, is a highly educated gentleman who speaks English fluently, once the interviewer is able to hear him.

Dr. Igarashi is an electrical engineer whose knowledge of the general subject of electricity and of electrical devices amazed C. H. Judson, the St. Paul telephone man, who has been showing the distinguished gentleman over the city. As an electrician, Dr. Igarashi was wonderfully impressed with the magnificent street railway system of Minneapolis and St. Paul, which he pronounced superior to anything of the kind he ever saw either in America or Europe.

"Other cities have electric cars," said the doctor, "but they are not such cars as you have — palace cars. Then the powerhouse, with its never-failing strength, there is nothing like it anywhere. Niagara is large, but as a splendidly equipped plant, it has no advantage."

Dr. Igarashi was greatly surprised to find that there were more than seven thousand telephones in operation in Minneapolis. In his native city of Tokio, with its million and a half of people, there are only seven thousand 'phones. But the imperial government has orders for 10,000 more, and it is to secure the best and latest in telephone equipment for this rapidly increasing service that Dr. Igarashi is in America.

"We use the Bell system at present, which is owned by the government," said Dr. Igarashi. "We have very little underground work, only the cables connecting the branch exchanges with the main building. Our overhead construction is very similar to that in America. We make our own iron wire, but we have to import from America the iron billets for the purpose, our iron being unsuited for wire manufacture. Our poles are of fir, cut in the mountains of the island of Nippon.

"We have never introduced the nickel-in-the-slot or measured service in Japan, owing to the fact that our rates are very low — $30 a year in American gold. However, I rather like the system and may put it in upon my return home.

"We have just begun to realize the possibilities of the long-distance telephone. We have now one line four hundred miles long extending from Tokio to Osaka. It works very satisfactorily, and it will not be long before the whole island will be strung with long-distance wires.

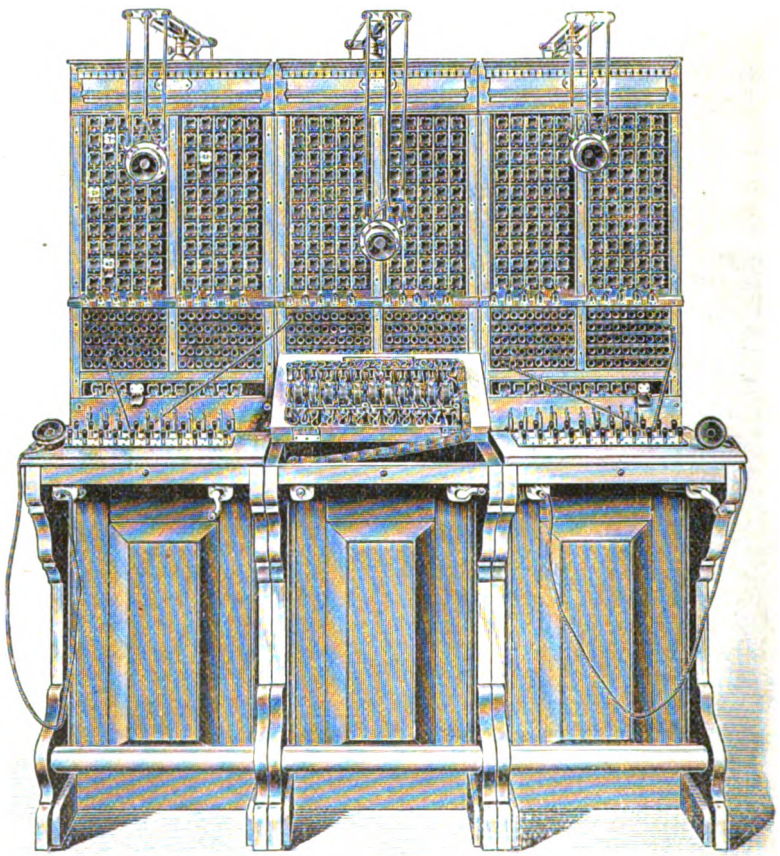
"Our people take very kindly to the telephone, which is somewhat remarkable when it is remembered that the messenger service in that country is the cheapest thing in the world. You can hire a messenger for a day for a few cents, the coolie labor being extremely cheap. One would suppose that cheap men and boys to run errands would make it difficult to induce people to establish telephones in their homes, but such is not the case. They like the novelty of it, and as we are the greatest imitators in the world, according to the Yankees, we must have the telephones."

Dr. Igarashi predicts a wonderful field for American manufacturers of telephone material in Japan as well as other Asiatic countries. The European manufacturers, he says, are behind the times in style and efficiency, and their apparatus is not comparable with that of this country.

Digitized by Google

## A PLAN FOR MUNICIPAL OWNERSHIP.

The Farmers' Telephone Construction Company, with offices at Milwaukee, Wisconsin, and a capital of $500,000, proposes to supply farming communities with telephones at a rental of $12 per year and a connection with the lines of the Wisconsin Telephone Company at a moderate toll charge. This would look somewhat chimerical were it not for the fact that the company has in its directory some of Milwaukee's strongest capitalists and business men whose financial representation is unquestioned. Therefore an exposition of their plans will be of interest and are best set out perhaps in their circular letter, most of which is given herewith.



The usefulness of the telephone has hitherto been practically restricted to the cities where, even at high rates, it is now absolutely indispensable. Low and popular prices will make it equally valuable and essential in rural districts. While the isolation of the farmer is in some districts somewhat reduced by the electric railway and a rural postal delivery, the great and completely civilizing method is concededly the telephone. With the lines already existing and with new connections so readily made, there is no reason why farmers should not have this greatest of all privileges at a price so small as to be within the easy reach of every one.

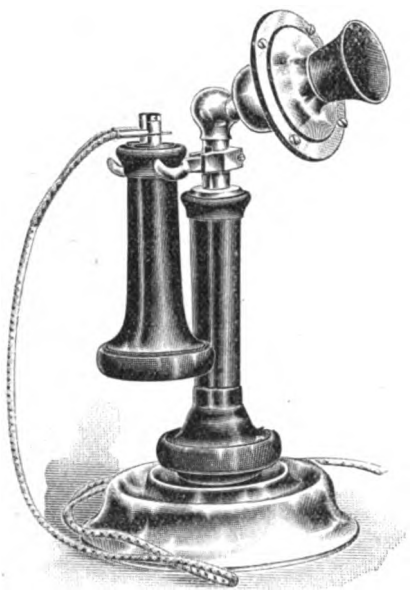
The scope of the enterprise, the plan of operation, and the measures secured to effect and complete a perfect service at low rates, have been the subject of most careful study on our part for the past three years, and the results of such investigation will bring almost inconceivable results to the farmer and country dweller, to whom we propose to make telephones available at $12 per year.

### HOW IT CAN BE DONE.

Anticipating this enterprise, provision was made by new laws passed at the last session of the Legislature, conferring upon townships

Digitized by Google

and municipalities the right to issue negotiable bonds, for the purpose of purchasing, maintaining and operating their own telephone systems. These bonds are not intended to become a burden to the township for either the principal or interest. The enabling acts provide, that when a majority of the freeholders of any township or municipality petition for a telephone service, it becomes mandatory upon the supervisors to issue bonds for the total cost of the plant. These bonds bearing interest at five per cent, are payable in twenty



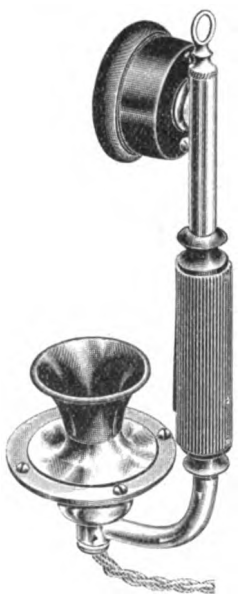
years, and deliverable after the plant is accepted as complying with specifications in every particular, and is connected by toll lines to all other similar township systems, and the Wisconsin Telephone Company's lines, as hereinafter described. The interests of the towns are otherwise fully safeguarded by statute; and further, we have executed a bond with the Secretary of State (with the National Surety Company of New York as surety) in the sum of one hundred thousand dollars ($100,000) for the faithful discharge of our agreements.

The initial move will be to build the township systems so as to accommodate not only the initial number of telephones subscribed for, but for a reasonable increase. The rate of $12 per year having been paid, communication will be free within the several townships, and we engage, at our expense, to connect all townships by toll lines, whereon a moderate toll charge will be made, and these lines in turn will be connected with the nearest toll station or exchange of the Wisconsin Telephone Company. For this purpose we have a long-time contract, and that company will also execute a contract of the same import with each and every township, thus guaranteeing service with all its lines, exchanges and connections, so long as the ownership and control of the lines remain with the township.

CONSTRUCTION AND OPERATION.

For example, the plan of construction and operation in your township will be substantially as follows: We would make an estimate of the cost of the system, say $8,000, more or less, and submit with our proposition, maps of the system as it will appear when completed, with full specifications. Upon the acceptance of that proposition we would proceed to construct the plant, which will furnish, thru a central switching station, free communication within the township to all parties subscribing to the service.

The scheme of operation provides for not to exceed four parties on each circuit. All circuits center in a switchboard at the central point, and are in charge of an operator. The most modern appliances will be used in switching. The system of calling is independent, i. e., each subscriber will be signaled without interference with the other, and all the latest devices, insuring prompt and certain results, will be adopted. The lines will be constructed in parallel metallic circuit, so balanced electrically as to neutralize induction disturbances from electric light wires or trolley lines. Each subscriber's station will be equipped with the long-distance instruments, manufactured by the Standard Telephone & Electric Company, of Madison, thus assuring



efficient service for unlimited distances. Assume, then, the system in your township, or adjacent townships, completed; these several townships will be connected with each other by the toll lines our company is to build, and with the toll lines and exchanges of the Wisconsin Telephone Company.

These connections provide the most comprehensive telephone system possible to con-

Digitized by Google

ceive, as every township subscriber will have, by connection with the ten thousand miles of toll lines operated by the Wisconsin Telephone Company, facilities with all the cities in Wisconsin, as well as access to Minnesota, the Dakotas and the Eastern States, over the lines of other companies operated in connection with the Wisconsin Company.

### FINANCIAL FEATURES.

A plan granting authority to the various municipal corporations for the establishment of telephone systems by direct taxation, would, we believe, have met with no legal objection in Wisconsin; but we propose to avoid the necessity of any tax whatsoever. The income from the lines themselves provides for the operating expenses and maintenance, for the annual interest on the bonds as the same falls due, and at the same time an annual sinking fund for the payment of the bonds at maturity.

Thoro investigation convinces us that one hundred of your freeholders, at least, will find telephones at $12 per year a desirable investment. The subscribers' lines in townships will be unusually long, hence somewhat more expensive than the shorter lines in urban construction; but a plant for the most thickly settled township should cost approximately $8,000. This, of course, remains to be determined after a careful survey, and if it can be built for less, the outlay will be thus reduced, but this sum is conservative for the purpose of our illustration.

| | | |
|---|---|---|
| Let us assume, then, 100 telephones at $12 yielding annually | | $1,200 |
| Bonds, bearing five per cent, makes an annual interest charge of | $400 | |
| To fund that debt in twenty years, set aside annually an additional five per cent, or | 400 | |
| Total interest charge | | 800 |
| Leaving for maintenance | | $400 |

The maintenance charge will be the hire of one operator, who will find it an easy matter to give prompt attention to one hundred and twenty subscribers. We fail, however, to see any considerable maintenance charge other than this, as the load on your poles is a fixed one — none carrying more than an 8-pin crossarm with its complement of wires, except those near the central, which will be correspondingly larger.

We assume the shooting of insulators, the theft of wire, and that lawless treatment common to commercial telephone plants will be defended against by the personal sense of ownership, and the trifling repairs necessary from time to time will be so equally borne as to represent but little outlay in money. Excepting lightning, or the occasional fall of a tree, the maintenance problem is, therefore, a very simple one.

The receipts from all subscribers over the number of one hundred will be so much independent revenue, to be used as the township authorities deem best. In addition to this, it must be remembered that, on this calculation, $400 each year, after the first, will be set aside, and can be carried at compound interest of not less than three per cent (3 per cent) to meet the payment of the principal of the bond at its maturity. The earnings of this yearly $400 cared for at only three per cent per annum, will amount upon the total issue of bonds as above estimated to nearly $2,400 between the issue and the maturity of such bonds.

Twelve dollars per annum is so low as to possibly raise the question whether, at such rates, the integrity of the proposition can be maintained. The Bell Company charges from $30 to $36 per year and the Independent companies $24 to $30. These rates are made imperative because of the expense in city systems of reconstruction of lines upon unprecedented expansion of business, so that the fair life of the materials has never been realized; by the large cost of conduit systems in large cities extending from time to time to smaller ones; the cost of management and engineering in long-distance connections, and the construction of special buildings and general offices. Substantially all these elements of expense are absent from the proposition we submit.

The township plant, on the other hand, is a fixed quantity, which will stand unalterable during the life of the plant and until the maturity of the bonds, and, as the project is not saddled with wear and tear, cost of management or necessity for dividends, the logic of our proposition stands plain. Our company expects to derive from the enterprise a reasonable percentage on the construction of these plants, but we have in mind more particularly the construction and operation in connection with them of a system of toll lines that will in the near future rival and surpass the mileage of the Wisconsin Telephone Company.

In other States many of the advanced farming communities have availed themselves long since of telephone service, but at a cost about twice the rate we propose. In Indiana about eight thousand telephones are used by farmers. In Iowa we have knowledge of several groups of farmers whose lines are being utilized, among other purposes, for a daily report of the local markets, and they have gone so far as to arrange for morning reports on live stock from Chicago, South Omaha and other cities, so they may determine the selling hour for themselves. This, however, has always been as the result of corporate enterprises, and at rates never less, and often more, than double the rates proposed under the town-ownership plan.

### ADVANTAGES SUMMARIZED.

Telephones will cost but one dollar a month. The town will absolutely own the system.

Bonds to be issued for purchase price to be paid for from the rentals of the users.

Digitized by Google

Interest on the sinking fund to reduce the cost twenty-four per cent.

The system will insure a large independent revenue to the town.

No tax will be levied for construction or maintenance.

It reduces taxation and increases the value of the land.

Every user in a town can communicate with every other user.

Every user can communicate with every other township, village and city in the State.

Every user has access to every connection of the long-distance inter-State system of the Wisconsin Telephone Company.

The current news of the world is brought to the country subscribers as soon as it reaches the inhabitants of the cities.

(Signed) GEORGE N. WISWELL,
*President.*

The best demonstration of the feasibility of the plan will be the building of the lines, which will, if successful, create a new line of development in this and other countries.

## WIRELESS TELEPHONY IN PRACTICAL USE.

A scheme was in contemplation for connecting the lighthouse of an isolated group of rocks, known as the Skerries, with the coast-guard station at Cemlyn, which is equipped with a postoffice telephone system. The rough nature of the bottom of the channel and the strong local currents were such as to prevent the laying of a cable, and it was decided to attempt communication by wireless telephony. A wire, seven hundred and fifty yards in length, was erected along the Skerries, and on the mainland another wire was carried from a point opposite the Skerries to Cemlyn, a distance of 3.5 miles. Each line terminated with an earth plate in the sea. The average distance between the two parallel wires was 2.8 miles, and with this installation telephonic communication was easily maintained between the two stations, and the service has proved to be practical and thoroly satisfactory.

A similar system of wireless telegraphy is now in course of erection between Rathlin Island, on the north coast of Ireland and the mainland. The excellent results which have thus far been attained prove that under existing conditions wireless telegraphy is a success, and may be easily and cheaply adapted to commercial needs. Communication from ship to ship and ship to shore can also be carried out equally as well, the circuit being formed by a copper wire terminated at each end of the ship in the sea.

The Rosenberg system is now in practical demonstration at the Crystal Palace; the coherer has a slight but very important alteration. The inventor claims he can communicate up to a distance of two miles without making use of the vertical wire, while with it the distance is said to be forty miles. An automatic repeating device has also been designed, which will be installed at intervals of forty miles. Mr. Rosenberg has also devised a modification of his system on a small scale, which should have an important commercial application. It consists of a small portable box containing the receiving apparatus as used in the system. When absent from his office one may receive notification of his desired attendance there by the tinkling of a small bell attached to the portable receiver. The office or business house may not be aware of the whereabouts of the person whom it is desired to call up, but so long as he is no further distant from the transmitting apparatus than two miles, he can be notified. Mr. Rosenberg has given practical demonstration of this contrivance with distinct success.

As the result of a favorable report, given by Admiral Colwell upon the steering of a small launch by Hertzian waves, based upon the invention of a young Englishman, the Admiralty has offered the inventor a large sum, provided he can successfully manipulate a torpedo while it is submerged. The German government also made a similar offer. The inventor has now accomplished the desired result and in the private preliminary trials he has steered the vessel with as much ease when it is submerged as when it is at the surface of the water.

In the torpedo the gyroscope is replaced by a wireless telegraphy receiving apparatus, which, acting upon a set of magnets, manipulates the rudder.—*Scientific American.*

Digitized by Google

### ARTIFICIAL RUBBER.

So long ago as 1892 it was discovered, purely by accident, that rubber could be obtained synthetically from turpentine. The process, so far as it has been developed, has no practical value, being slow and uncertain, but a slight increase in chemical knowledge may change the whole situation and injure the industry of the rubber planters.

Substitutes for rubber have been obtained in a variety of ways, one of them being derived from the oil expressed from germs of maize. This artificial product, which is evolved by combining the corn oil with sulphur, is described as a "horny, elastic body, with many of the properties of caoutchouc." Another process utilizes linseed oil, which is treated with nitric acid and mixed with nitro-cellulose, the resulting substance being called "velvril." This velvril can be worked or molded under heat and pressure, or it may be converted into a varnish by dissolving it in a suitable solvent.

### ANOTHER RAILROAD TO ADOPT TELEPHONES.

The Erie has recently given the telephone a test over the telegraph wires. An instrument was attached to the regular telegraph wires and a conversation passed between officials in Akron and at Galion. The experiment was entirely successful. Other Eastern roads will undoubtedly adopt the telephone.

### DEVELOPMENT OF THE TELEPHONE IN THE UNITED STATES.

Late statistics estimate that the telephone business of the country has been developed only to about twenty-five per cent of its possible extent. This estimate is based upon the premise that development in San Francisco and Los Angeles has reached seventy-five per cent. San Francisco, with 342,000 population, has 26,600 telephone subscribers, and Los Angeles, with 102,000 population, has 7,800 subscribers. These are the highest percentages in the country.

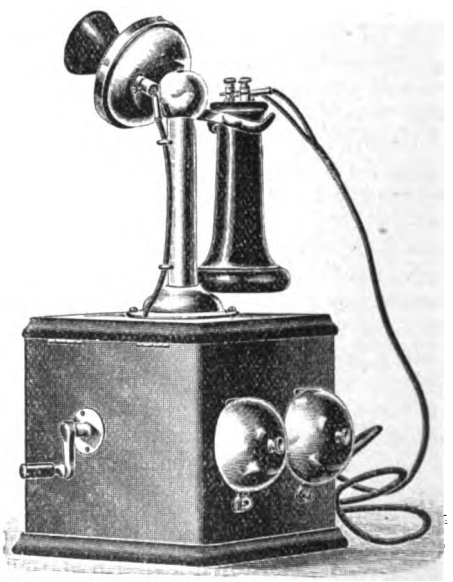
### TO PRESERVE WOODEN POLES.

The following method is suggested for preserving wooden trolley poles from decay due to moisture or boring insects:

First, char the pole for from four to six feet on the butt end, about ¼-inch deep from the surface. Then apply the following preparation: One gallon of twenty-five per cent crude carbolic acid, mixed with five gallons of coal tar, putting on one or two coats after the pole is thoroughly dried; the composition should not be applied while the pole is green. It is said this mixture will kill all eggs or worms that may be in the pole and will prevent others from being deposited.

### A NEW DESK SET.

The illustration is a new desk set designed by The Hipwell Manufacturing Company, of Allegheny, Pennsylvania. The generator, ringer and induction coil are all in the base — in



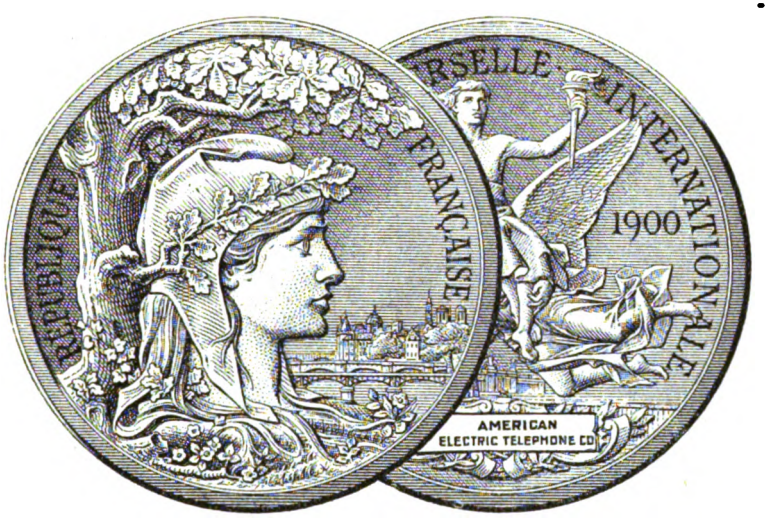
fact, the complete 'phone, except the batteries. This feature has advantages which commend themselves to all telephone men. It is neat and attractive in appearance and an ornament to any desk. These desk sets are made for series or bridging systems.

Digitized by Google

## FIRST PRIZE MEDALS AT THE PARIS EXPOSITION.

Among the many American exhibitors at the Paris Exposition to secure high honors is the American Telephone Company, of Chicago. This company displayed its full line of apparatus and had undoubtedly one of the most interesting exhibits to be seen at the Exposition. It was awarded the first prize for superiority in every detail. This speaks well for the American's apparatus, for the leading manufacturers of the world were there to compete for the honors the American Company so successfully carried off.

We produce a facsimile of the medal awarded the company.




## RUSSIAN FRANCHISES.

Russia has set an example for the world in obtaining some returns for franchises voted. Having telephone franchises in the leading cities to dispose of, the Government prescribed the conditions and then put the franchises up at auction, the bidder offering the lowest terms for service under the conditions prescribed to have the franchise. St. Petersburg had been paying 250 rubles, or $192.50 annually, but under the new franchise the rate will be 45 rubles annually, equivalent to about $34 in American money. In other cities the franchises did not net terms so favorable for the people, the Moscow rate being 79 rubles, or $60.80; Odessa, 48 rubles, or $37; Riga, 57 rubles, or $44; Warsaw, 69 rubles, or $53.10. The Western Electric Company, of the United States, bid unsuccessfully everywhere. This means the Bell Company.

The prices for restaurants, hotels, etc., are thirty per cent higher for a single user and ten to twenty per cent lower for telephones in general use, the custom being to place telephones in a corridor for the use of an entire building. The long-distance lines remain the property of the Government.

## BELGIAN TEST OF WIRELESS TELEGRAPHY.

The official tests of the Marconi installation lately installed on the Ostend boats took place November 9, and were completely satisfactory. The Belgian Government officials, after viewing the instruments on board the Princess Clementine, went to La Panne, the land station, while the vessel started for Dover. Messages were continually exchanged during the journey, and just before reaching Dover one was received from M. Gérard, the chief of the Belgian Cabinet, conveying his congratulations to the Marconi Company. The message was transmitted to Dovercourt, near Harwich, thence to Chelmsford, and by telephone forwarded to the London office of the company.

Digitized by Google

## TRADE NOTES.

CREAM FLUX COMPANY, Chicago, is selling an enormous quantity of its soldering compound.

NORTH ELECTRIC COMPANY, Cleveland, Ohio. This company makes a specialty of putting on the market some high-grade goods.

GEORGE B. PRATT, representing Eureka Electric Company, Gowanda, New York, will be pleased to send his beautiful catalog to any address.

CHICAGO TELEPHONE SUPPLY COMPANY has sold a very large number of its express switchboards. This company also manufactures a good line of 'phones.

FARR TELEPHONE SUPPLY COMPANY, Chicago. We are informed that the Farr Telephone Supply Company was awarded a bronze medal at the Paris Exposition.

STERLING ELECTRIC COMPANY, Lafayette, Indiana, is getting out its New Year's literature, and would be pleased to mail you the entire set of it if you will kindly write for same.

KELLOGG SWITCHBOARD & SUPPLY COMPANY, Chicago. This company has contracts for several of the largest exchanges in the country which are now in the course of construction.

CENTURY TELEPHONE COMPANY, of Cleveland, Ohio, reports an unusual run of business. This company manufactures a line of instruments and equipment that is up to date in every detail.

ELECTRICAL APPLIANCE COMPANY, Chicago, announces that it has an unusual run of business and that it is ready upon receipt of your address to send you some interesting telephone literature.

THE Eureka Electric Company, Chicago, announces that it is now ready to fill orders for its twentieth Century Catalog. The price of this catalog is the asking for it. For one interested in telephony it is worth ten times the price.

WESTERN CONSTRUCTION COMPANY, Chicago, is sending out beautiful little pieces of lithographed work entitled, "The Old Oaken Bucket," and "I Ain't Seen No Rooster." These two little lithographs are about the nicest things we have seen in the way of advertising novelties. Send your address and the company will do the rest.

AMERICAN ELECTRIC TELEPHONE COMPANY, Chicago, reports that its business has been fully up to the standard, and every party knows what the standard is for the American Company. This company issues a very attractive catalog.

THE Eureka Electric Company reports quite a flourishing business, particularly noticeable in its Flash Light Supervisory Switchboard, having just closed contracts for quite a number of very large boards. The new type "C" Cable Heads and Terminals are giving splendid satisfaction.

THE Chicago Plating & Enameling Company, Chicago, has undoubtedly one of the finest equipped plating establishments in the country, and makes a specialty of doing work for out-of-town parties. Work received one day will be returned upon the following day. The quality of the work the company does speaks for itself.

## THE IOWA ABSORBED.

The Iowa Telephone Company will be absorbed by the Central Union Company. The Iowa stockholders have agreed to exchange their holdings for Central Union stock. The majority of the $769,900 stock and of the $200,000 of bonds of the Iowa Company is owned by two other Bell concerns, the Central Union and the American Telephone & Telegraph Company, so that there was not much of a clash among the Iowa stockholders in making the deal.

## A MARCONI TEST.

For some time the Marconi Wireless Telegraph Company has had a station at Dovercourt, England, and at a trial of the apparatus at that place, messages were sent to the mail steamer Princess Clementine, which had on board as operators Messrs. C. Ricard and F. Hacy, and as a guest Mr. M. S. Kurino.

The working of the signals commenced when the steamer was half way across the channel and the messages were successful, averaging twenty words to the minute.

Digitized by Google

## A RECORDING TELEPHONE.

COMBINATION OF PHONOGRAPH AND TELEPHONE WHICH WRITES AUTOMATICALLY.

The telephonograph is a combination of the phonograph with the telephone, and is intended to take and record telephone messages by automatic means, and, to a limited extent, give an answer in the same way. It is the invention of Mr. J. E. O. Kumberg, and an example of the instrument is to be seen at the office of Messrs. H. F. Joel & Co., 31 Wilson street, Finsbury, England. The combination is simple in general principle, but some ingenious mechanism has been introduced to make the working effective. The message is spoken by the person sending it into the telephone in the usual way, and the vibrations set up by the voice are caused to act upon a recording stylus by the impact of the sound waves. In this way the wax cylinder in the office of the person spoken to is indented and a phonogram is produced. This, of course, can be read off at leisure in the usual way. The vibrations are transmitted either directly or indirectly, in the latter case an electrical current effecting the object. A highly sensitive transmitter of any well-known form is used. If it is desired, the instrument may be so arranged that two wax cylinders, or phonograms, may be inscribed, the one being in the office of the sender, to be retained as a record, and the other, an exact duplicate of the first, being produced in the office of the receiver. To effect this end the transmitting instrument has two channels or tubes for the sound waves produced by speaking into the mouthpiece. One of these channels leads to the speaking or recording diaphragm of the instrument at the transmitting station, which engraves them upon the phonogram blank. At the same time identical sound waves are electrically conveyed to the receiving instrument at the distant station of the person spoken to, and are there imprinted on another phonogram blank. It is possible to throw the phonograph action out of play and use the telephone in the ordinary way.

Neither the telephone nor the phonograph is perfect in its action, and unpracticed persons are apt at times to experience some difficulty in translating the sounds either one or the other produces into articulate speech; and when the deficiencies of the two are combined, difficulty is still more likely to arise, altho proficiency is attained to a remarkable degree by practice. In order to overcome this defect a special design of recording diaphragm cell has been devised by the inventor. It consists of a double-cell micro-diaphragm having two compartments, one of which is fitted with a multiple or other suitable microphone diaphragm disk and the other side with a sensitive disk of glass. This receives the undulations produced by the sound waves and communicates them to the recording stylus. Below the glass diaphragm is a guard, which serves to confine the sound, and also as a shield against the scraping noise which the stylus makes by cutting into the wax cylinder. One of the most important features of the invention is a floating weight controlled by a spring which is attached by means of a pivoted lever and a fine wire to the two disks, already mentioned, of the double-cell micro-diaphragm. The pivoted lever carries the recording and reproducing tools by which the sound vibrations are respectively engraved upon or reproduced from the wax cylinder. The action of the weight is to give additional power, or perhaps, rather, additional certainty and steadiness to the cutting and reproducing tools. Such weights have before been used to supply what may be described as a fly-wheel effect, thus enabling the cutting tool to overcome any irregularities in the composition of the wax. The weight, however, is apt to rebound through its own momentum, and thus defeat the end for which it is provided. To overcome this defect a spiral spring is fitted in the machine under notice, with the result that the jumping or vibratory motion is damped. It is claimed that by this device a deeper cut is made in the wax cylinder than has before been obtained, and the reproduction of the sound waves is thereby made more perfect.

Digitized by Google

We lately had an opportunity of testing this invention to the extent of transmitting a message from one room to another adjoining, altho the length of wire represented a considerable distance. As reproduced by means of the phonogram, on which the message was recorded, the words were distinctly audible, the result being equal to that of any ordinary phonograph. Mr. Higgins, chief engineer to the Exchange Telegraph Company, has tested the apparatus over a line five miles in length. He reports that under favorable circumstances "articulation is good, the impressions on the cylinders being as deep as the impressions made when speaking into an ordinary phonograph." Large battery power is needed, and a reinforcing current is required at the receiving and registering line.

In regard to the practical utility of the apparatus, those who have had experience with the telephone and the phonograph will be able to judge from the description here given. It would be most applicable in small offices where a limited staff is employed. Thus if the office is left without an attendant and a call is made, the phonograph can be set so as to reply "Mr. —— is out." The instrument is fitted with a telephonograph which will automatically take down any message you may send, and "Mr. —— will read it on his return." The arrangement of the mechanism is such that any number of messages up to an aggregate of 15,000 words may be taken in this way.

We add a brief description of a new telegraphone, which covers in part the ideas involved: "The steel band on which records are made is wound on four rollers arranged in a rectangle, and the winding is so arranged that the band is continuous. For a reproduction of the record it is not necessary to reverse the band and start it again, but simply to let it run on. The cores of both the recording and reproducing magnets touch the band at an angle parallel to its width and are not set up perpendicular to its surface. The wires are guided by four brass forks mounted near the rollers.

"The whole apparatus is driven by a one-sixteenth horse-power electric motor, giving a variable speed.

"The duration of speech is two minutes. That is not much for a phonograph, but, of course, it can be increased by increasing the number of rollers or the distance between them. Several hearing magnets can be arranged, and, if it should be necessary to repeat a short passage, that can be done by mounting a hearing magnet on another part of the wire and switching it on as required."

## THE STROUD MEASURE SERVICE DEVICE.

How to keep a record of all calls where you have measure service is a problem that has presented itself to every exchange manager. Of course there are a good many different systems by which services can be measured, but they are all more or less faulty. The faults that present themselves are that they are troublesome in reading and take the operator's time. But with the Stroud meter it is different. In Fig. 1

FIG. 1.

the subscriber's instrument is shown with the meter by its side. When the subscriber wishes to call a party he signals the operator in the usual manner

Digitized by Google

and gives his order. He is now asked to press his button, which notifies the operator by a buzzer in close proximity with the transmitter. The act of pressing the button as well as signaling the operator performs a function which the inventor calls "storing a call," that is, it winds a spring one notch. This spring is held in check by an electro-magnet. Now at the end of each month, when it is desired to read the meter it is done in the following manner: The instrument shown in Fig. 2 is the reading instrument. It is connected to the subscriber's line and a current is now sent over the circuit which releases the stored-up call, which now acts upon the reading machine — that is, for every stored call the dial moves one notch. This instrument is bound to be fair to both exchange owner and subscriber.

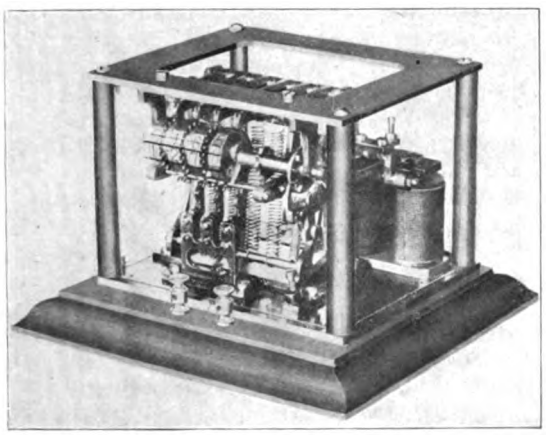


FIG. 2.

## CUTTING RATES AT COLUMBUS, OHIO.

Beginning the first of January a radical cut will be made in the telephone rates at Columbus by the Central Union Company. This action was determined upon at a meeting held in this city, at which were present president W. A. Jackson, general manager M. J. Carney, general solicitor L. G. Richardson, all of Chicago, and the local officials. It was said the recent improvements in the operation of telephone systems render the reduction possible.

The new schedule of rates in some instances is more than one-half less than that in force now. The Independent long-distance residence telephones, with copper metallic circuit, will be reduced from $54 a year to $24, and Independent lines, with the Blake equipment, will be cut from $40 to $20. Party lines will range in price from $12 to $16, a reduction of from $4 to $8.

## CUMBERLAND PURCHASES.

President James E. Caldwell, of the Cumberland Telephone Company, announces that his company has purchased the telephone systems of Paris, Perryville and Elizabethtown, Kentucky, and Cleveland, Tennessee. Each town has a separate system, and the acquirement of the additional territory is regarded as no little expansion.

By this purchase the Cumberland Company enlarges its list of subscribers by 1,000, and adds 300 or 400 miles to its pole route.

The company also announces the purchase of the telephone systems of Nicholasville, Stanford, Lebanon and Danville, Kentucky. The three former exchanges were owned by J. A. Kelly and B. T. Conway, who sold out for $25,000. The price paid for the Danville plant is withheld.

## BRIGHTON (ENG.) MUNICIPAL CONDUITS.

The Hove Council, having withdrawn its opposition to the municipal telephone scheme of the Brighton Corporation, specifications for the municipal exchange will be prepared by Mr. A. R. Bennett, in which provision is made for the tramways for the necessary conduits which carry the underground telephone wires; these conduits being stoneware pipes laid in cement in a manner similar to those used in connection with the tramways.

## FIRST PRACTICAL USE OF THE TELEPHONE.

The telephone was first practically used in England in 1876, when over 115 miles of wire existed between London and Norwich.

Digitized by Google

## TELEPHONING ON TELEGRAPH LINES.

Chief Operator Hargrave, of the Postal Telegraph Company, New Orleans, for some time past has entertained the idea that he could utilize the telephone on telegraph line repairing. Recently he made a number of most interesting and successful experiments in his method of composite telephone and telegraph service, in connection with Manager Roberts, of the Postal Telegraph Company's Mobile office. A modification of Van Rysselberghe's system of simultaneous telegraphy and telephony was tried over experimental circuits with great success. This system consists in bridging over two telegraph wires which are being worked as regular Morse circuits, with a telephone set at each end. The two circuits are then worked independently as telegraph circuits, and at the same time were talked over thru the 'phones.

While it is not the intention of the Postal Company to introduce the telephone in a commercial way, it expects to utilize the 'phone in communicating with its linemen along its route, and thus greatly facilitate and expedite the repairing of its lines in times of wire trouble. These linemen not being operators they can, by this arrangement, be communicated with by telephone over a wire being worked as a Morse circuit, and in no way interfering with the latter. In this system two Morse circuits, or rather the two halves of two separate Morse circuits, are used to constitute one telephonic circuit, and yet not interfere with the perfect working of each of the Morse circuits independently.

Besides being of great practical utility in facilitating the work of the linemen, the experiments proved that two circuits could readily be made into three without the addition of any more wires and without interfering with each other. The conversation with Mobile was kept up without trouble and at the same time Morse instruments at each end were transacting the regular business. The experiments have thus far been successful.

---

MAY be you are wanted. See our Want Ads.

## A PECULIAR CASE.

Dr. W. H. Hannum, a physician of Petersburg, Grant County, West Virginia, was awarded $4,500 damages in a suit against the Petersburg & Franklin Telephone Company. Dr. Hannum was injured one night last January, while riding along the road near Petersburg by being thrown from his horse, the animal's feet having become entangled in a wire which had fallen from the poles. Two ribs were broken and his kidneys were badly lacerated. Dr. Hannum's chief counsel was Attorney J. N. McMullen, who is one of the principal stockholders. The judge of the court, R. W. Dailey, being also a stockholder, Henry Gilkeson, of Romney, sat as judge. Two of the attorneys for the defense were likewise stockholders, as are also Dr. Hannum's partner and others interested in the case. Many of the stockholders are among the wealthiest men in that section, and took stock in the organization simply to help along a new industry. The entire system within itself is probably not worth over $1,000. The suit was brought for $7,500. Motion for a new trial was entered.

---

## 'PHONE DISPLACES TELEGRAPH.

The substitution of a long-distance telephone system for the present telegraphic method of communicating between its general offices and its stations has been decided upon by the Northern Pacific Railroad. The telephone is in use as an auxiliary service on some Eastern roads, but this is the first time it has been adopted by a Western road.

The plan is to place each station on a division in direct communication with the division headquarters and the several division headquarters are to be connected with the general offices by long-distance lines. In this way much necessary information of importance to the traffic and operating departments, which on account of the limitations of the telegraph system must now be sent by mail, can in the future be telephoned at once.

The new service will be extended so as to do away with the old system wherever practicable.

Digitized by Google

# TELEPHONE NEWS.

HARRINGTON, ORE.—An Independent telephone exchange has been opened here.

KANSAS CITY, MO.—An ordinance has been passed here lowering telephone rates.

WAUSHARA, WIS.—The new telephone exchange here will soon be in working order.

ASHLEY, OHIO.—A Citizens' Independent Telephone Company has been organized here.

ALBANY, N. Y.—The Duchess County Telephone Company was incorporated. Capital stock $125,000.

CLINTON, ILL.—The Farmers' Telephone Company has secured a franchise to bring its line into Clinton.

APPLETON, WIS.—The Fox River Valley Telephone Company has been incorporated. Capital stock, $25,000.

TOLEDO, OHIO.—The strife between the Southwestern and Independent Telephone Companies still continues.

ELGIN, ILL.—The contempt case against the Northwestern Telephone Company is on trial at Geneva, Illinois.

GENEVA, OHIO.—The capital stock of the Conneaut Telephone Company has been increased from $30,000 to $50,000.

SAN DIEGO, CAL.—The Sunset Telephone Company is about to establish a new telephone exchange at Coronado Beach.

RACINE, WIS.—The Citizens' Telephone Company is organizing exchanges at Monmouth and Streator, Illinois.

WINNSBORO, S. C.—The South Carolina Long Distance Telephone Company has applied for a charter here. Capital stock, $50,000.

EUREKA, NEV.—A telephone company has been organized in Salt Lake, for the purpose of connections with all the surrounding towns.

NEW PARIS, OHIO.—A local telephone company has secured a franchise to build and maintain a telephone exchange here, and will provide for connections with all the surrounding towns.

PEORIA, ILL.—The Independent Telephone Company has completed its lines between Pekin and Manito, and is now on its way to Havana.

DANVILLE, ILL.—Vermilion County Telephone Company has secured a franchise to operate a telephone system here. Capital stock, $60,000.

HAGERSTOWN, MD.—The Tristate Telephone Company now has a complete new set of officers, and intends to remodel its exchanges.

PEKIN, ILL.—A franchise has been granted the Mutual Telephone Company to erect, maintain and operate a telephone exchange here.

LOUISVILLE, KY.—The Cumberland Telephone & Telegraph Company has secured a franchise to build and maintain a telephone exchange here.

LOUISVILLE, KY.—The Boyle Citizens' Telephone Company has sold out to the East Tennessee Telephone Company, possession to be given at once.

SPRINGFIELD, ILL.—The Macoupin Telephone & Telegraph Company has completed the work of installing a system in this city, and the same is ready for use of subscribers.

WEST POINT, GA.—After several weeks of negotiations between the Southern Bell Company and the local company, West Point is at last assured of first-class telephone service.

LOUISVILLE, KY.—The Cumberland Telephone Company has assumed charge of the local plant recently purchased from Paris Telephone Company and is making great improvements.

LEXINGTON, KY.—A franchise has been granted the Fayette Telephone Company to build and maintain a telephone exchange here, for the purpose of connecting with all the surrounding towns.

SALT LAKE, UTAH.—The telephone extension north toward Malad has reached Samaria, and that settlement is now in communication with Ogden and Salt Lake. The southern extension reaches Mount Pleasant. There were

Digitized by Google

seventy-four new telephones put in service in this city during October.

WORCESTER, MASS.—The new telephone line is working well and is largely patronized.

BLOOMINGTON, ILL.—The new telephone line between Beason and Atlanta is now in operation.

LA PORTE CITY, IOWA.—The Audubon County Telephone Company has filed articles. Capital stock, $25,000.

COLUMBUS, OHIO.—The New Washington Telephone Company filed articles of incorporation. Capital stock, $5,000.

MADISON, WIS.—The Farmers' Telephone Company has secured a franchise here and filed articles. Capital stock, $10,000.

CHATTANOOGA, TENN.—The Tennessee River Telephone Company has been organized, and commenced construction of system.

BUFFALO, MINN.—The Minnesota Telephone Company has secured a franchise to build and maintain a local exchange here.

WABASH, IND.—The New Home Telephone Company has commenced operations here and has quite a number of subscribers.

BIRCHWOOD, TENN.—The Tennessee River Telephone Company has been organized, and commenced construction of system.

ALEDO, ILL.—Ed Dool, proprietor of the City Telephone Exchange, has disposed of the same to J. W. Edwards, of Phœnix, Arizona.

LOUISVILLE, KY.—The East Tennessee Telephone Company has just completed its line from Madisonville as far as Dawson Springs.

BALTIMORE, MD.—The Home Telephone Company organized in Cambridge to oppose the Diamond State Telephone Company.

GRAND RAPIDS, MICH.—The Citizens' Telephone Company has secured a franchise to build and maintain a telephone exchange here.

OAKLAND, IOWA.—The Independent telephone line from Harlan to Avoca is to be extended here and connect with the local line to Carson and Hastings.

XENIA, OHIO.—Work on the Citizens' Telephone Company plant will commence soon. Efforts are now being made to obtain a sufficient number of subscribers.

ALBANY, N. Y.—The Duchess County Telephone Company, of Poughkeepsie, has filed articles of corporation. Capital stock, $125,000.

NASHVILLE, TENN.—The Cumberland Telephone Company is trying to secure a franchise for the purpose of establishing a local exchange here.

FINDLAY, OHIO.—Work on the Home Telephone Company is being pushed rapidly, so that the system will be in running order by January 1, 1901.

CHATTANOOGA, TENN.—The Cumberland Telephone Company intends to make extensive improvements, construct underground telephone conduits, etc.

DULUTH, MINN.—The Zenith Telephone Company and the People's Company, of Superior, will consolidate, under the name of the People's Company.

ALBERT LEA, MINN.—Manager Johnson is putting in a number of telephones thruout the city, which will be operated by means of the central energy board, by which connection will be had by simply taking down the receiver.

COLUMBIA, S. C.—The South Carolina Telephone Company has secured a charter for the purpose of connecting all portions of South Carolina with the Independent telephone lines. It has started with a capital stock of $500,000.

ATHENS, MICH.—The Northern Indiana and Southern Michigan Telephone Company has filed articles of corporation. The company will build and operate toll lines in southern Michigan and northern Indiana. Capital stock, $30,000.

EDWARDSVILLE, ILL.—A franchise has been granted the Kinloch Telephone Company to erect poles and string wires along the streets of the city. By this franchise the company has a right to make connections all thru the surrounding cities.

CROOKSTON, MINN.—A telephone line is being erected from here to Beltrami, Gary and Fertile. Another line is being erected from private parties to Halstead, Hendrum, Perley and Shelley, so Ada

Digitized by Google

will soon have connections with all the towns around here.

HAVANA, ILL.—A new exchange is about to be established here.

CAMPBELLSTOWN, OHIO.—A rural telephone company has been organized here.

LAFARGE, WIS.—This place is soon to have an Independent telephone exchange.

FONDA, N. Y.—The new telephone company here has moved into larger quarters.

BATAVIA, N. Y.—An Independent telephone company has applied for a franchise here.

ARBELA, OHIO.—The telephone line between this place and Byhalia was lately put into operation.

ROCHESTER, N. Y.—The Campbell, Thurston & Risingville Telephone Company has been incorporated.

NEW PARIS, OHIO.—Work on the new Independent telephone exchange is being pushed forward rapidly.

SPARTANBURG, S. C.—The Citizens Telephone Company will expend $8,000 for improvements to its system.

ITHACA, N. Y.—The Black River Telephone Company is now furnishing connections to the entire county.

SALEM, OHIO.—The Independent telephone exchange here will soon have connection with the entire county.

BLOOMINGTON, OHIO.—The Clinton Telephone Company has recently opened up its telephone exchange here.

BIRCHWOOD, TENN.—The Tennessee River Telephone Company has been organized, with B. L. Toley, president.

COLLINSVILLE, ILL.—The Kinloch Telephone Company is pushing the work on its exchange here very rapidly.

EAST LIVERPOOL, OHIO.—The Columbia County Telephone Company has commenced work on its exchange here.

CALDWELL, OHIO.—The Caldwell Independent Telephone Company has been incorporated; capital stock, $5,000.

CLINTON, ILL.—Farmers' Telephone Company was granted a franchise to build and maintain a telephone exchange here.

HONEOYE FALLS, N. Y.—The trouble between the Independent company and the Bell company here has been settled in favor of the Independent company. It is now rapidly finishing up its new exchange here.

BROWN COUNTY, Indiana, which has neither railway nor telegraph facilities, is now being invaded by a telephone system.

SPRING VALLEY, ILL.—The Bureau County Telephone Company will soon begin to install telephones in all private houses here.

KEYSTONE TELEPHONE COMPANY, at Bucks County, Pennsylvania, will soon be in connection with all the surrounding counties.

OPELOUSAS, LA.—There will soon be an Independent telephone exchange here, for the franchise was granted several days ago.

GOOD HOPE, ILL.—This place will soon have an Independent telephone exchange, and will be able to connect with the entire county.

GREENVILLE, OHIO.—The new Independent telephone exchange here has the exchange in complete operation, all ready for business.

TORONTO, CAN.—The Bell Telephone Company has taken out a permit to erect a two-story brick office on Hayden street, to cost $12,000.

DYERSVILLE, LA.—The Independent exchange here went thru a complete renovation and is now one of the finest exchanges in the State.

ATHENS, MICH.—The Citizens' Telephone Company has had a force of men rebuilding its lines and exchange, and it is now in first-class condition.

ST. ALBANS, VT.—A new telephone and telegraph company, organized in Barre, will be known as the Washington County Telephone Company.

STREATOR, ILL.—Mr. Adler, who recently secured a franchise for an Independent telephone company at Streator, is now helping to get one for Ottawa.

SCRANTON, PA.—The work of erecting poles for the Carbondale Telephone Company is progressing very rapidly and the exchange will soon be in operation.

MONROE COUNTY, WIS.—The Monroe County Telephone Company is building a line to Shamrock, being now within one and a half miles of that place.

Digitized by Google

where they will connect with the Jackson County system.

NORFOLK, VA.—Norfolk is to have a new Independent company.

THE Nebraska Telephone Company will build a line from Kearney to Minden.

EL DORADO SPRINGS TELEPHONE COMPANY, Kansas City; capital stock, $10,000.

AURORA, ILL.—Aurora's two telephone companies are putting in many new instruments.

AKRON, N. Y.—The local telephone line at Akron will be completed by the first of December.

THE People's Telephone Company organized with a capital stock of $200,000 at Norfolk, Virginia.

HUNTINGDON, W. VA.—The Huntingdon & Clearfield Telephone Companies have been incorporated.

LYKENS, PA.—The Juniata & Susquehanna Telephone Company is about to build a telephone exchange here.

WAUPACA, WIS.— Harry Slater says he will have his telephone exchange in this city under way in about two weeks.

THE Fox River Valley Telephone Company, at Appleton, Wisconsin, was organized, with a capital stock of $25,000.

HARRISONVILLE, MO.— Quick Telephone Company, of Harrisonville, has incorporated, with a capital stock of $20,000.

POUGHKEEPSIE, N. Y.— Poughkeepsie will have a new telephone company, to be known as the Dutchess Telephone Company.

PARIS, TEX.—A new telephone company has been granted a franchise by the city council. Home capital is interested in it.

ALTON, ILL.—The application of the Kinloch Telephone Company for a franchise was granted at the council meeting at Alton.

JACKSON, MICH.— The Bell Telephone Company has been granted an ordinance to erect poles and string wires in Jackson, Michigan.

WESTCHESTER COUNTY (N. Y.) TELEPHONE COMPANY has been organized to build and operate a telephone exchange in this vicinity.

BLUE EARTH VALLEY, MINN.— The Blue Earth Valley 'phone people have a large force of men at Blue Earth putting in a new exchange.

THE Highlands Telephone Company is extending its line from Delta and will soon make connections with the Ross Line, which runs to York, Pa.

CHATTANOOGA, TENN., is again talking about having an Independent telephone system in opposition to the East Tennessee Telephone Company.

WEST SUMNER, ME.— The Oxford Telephone Company has been organized to run a line thru Buckfield, Sumner, Paris, Woodstock and Greenwood.

LITTLE ROCK, ARK.—The business of the Ozark Telephone Company, which owns nearly all of the lines in North Arkansas, went into the hands of a receiver.

GILMAN, ILL.—The Danville Telephone Company has passed into the hands of Messrs. Henderson & Davis. The firm controls a number of the exchanges in the surrounding towns.

COLUMBIA, S. C.—Application has been made for the charter for the South Carolina Long Distance Telephone Company; capital stock, $5,000,000; to construct telephone systems from Columbia to Charleston and other cities.

BALTIMORE, MD.— Baltimore & Belair Telephone Company has been granted the privilege of establishing a telephone system in the city of Havre de Grace. When this line is completed it will give the city long-distance connection.

WEST CHESTER, PA.—The Chester County Telegraph & Telephone Company has bought a controlling interest in the Octoraro Telegraph & Telephone Company, of Oxford. The former concern is now extending its lines and will shortly have connection with Wilmington, Norristown and other places.

THE Stromberg-Carlson Telephone Manufacturing Company recently purchased from Charles T. Yerkes the property at 197-201 Clinton street, 75 by 156 feet, east front, 100 feet south of West Jackson boulevard, for $19,000. The old four-story warehouse on the ground is to be razed and an eight-story factory structure, with all modern

Digitized by Google

appliances, is to be erected at a cost of $60,000.

WHITTIER, CAL.—Whittier is to have a new telephone system.

INDIANAPOLIS.—The new Brazil Telephone Company; capital stock, $10,000.

MINNESOTA.—St. Peter Telephone Company has increased its board capacity.

RISING SUN.—A telephone cable has been laid across the Ohio River at Rising Sun.

KENOSHA, WIS.—The Wisconsin Telephone Company was granted a franchise.

AUSTIN, TEX.—The Bryan Telephone Company, of Bryan, has a capital stock of $12,000.

CANTON, OHIO.—The Independent Stark County Telephone Company was granted a franchise.

MT. PLEASANT, IOWA.—The Winfield Telephone Company has filed articles of incorporation.

COLUMBIA, S. C.—The Island Telephone Company was chartered, with a capital stock of $4,000.

HAMILTON, OHIO.—The Harrison Telephone Company was incorporated, with a capital stock of $5,000.

CORSICANA, TEX.—The Corsicana Telephone Company was chartered, with a capital stock of $50,000.

WISCONSIN.—The Wisconsin Telephone Company has enlarged its capital stock from $3,000,000 to $5,000,000.

POMEROY, OHIO.—George Titus, of Langsville, was granted a franchise to enter Vinto with his telephone line.

HARRISON, OHIO.—The Harrison Telephone & Exchange Company was granted a franchise for twenty years.

MOOREVILLE, IOWA.—The Cedar Valley Telephone Company has nearly completed its new line to Washburn.

STANLEY TELEPHONE COMPANY.—The Gaston Telephone Company has been incorporated, with a capital stock of $10,000.

SPRINGFIELD, ILL.—Certificates of incorporation were issued by Secretary of the State Rose as follows: The Vermilion County Telephone Company, Danville; capital stock, $60,000; to operate a telephone system.

OTTUMWA.—The Ottumwa Telephone Company has filed articles of incorporation amended so as to increase the capital stock from $40,000 to $75,000.

CROOKSTON, N. D.—Articles of incorporation of the Ada Telephone Company, with a capital stock of $3,000, have been filed with the Secretary of State.

BELAIR, MD.—The Highland Telephone Company is extending its line from Delta and will soon make connections with the Ross line, which runs to York, Pa.

LORAIN, OHIO.—This city is about to have a telephone war, the Bell company being ready to petition the city council for a franchise for the equipment of a local exchange.

SAVANNAH, GA.—Telephone system. The Georgia Telephone & Telegraph Company contemplates making additions to its plant, including the underground cable service.

JACKSON, NEB.—The Nebraska Telephone Company will build a line from Kearney to Minden. The line will run straight south from Kearney a distance of twenty-five miles.

WABASH, IND.—The telegraph companies are to receive attention from the members of the legislature at the January session. The plans proposed will help the telephone companies.

FULTON, KY.—The Cumberland Telephone Company has absorbed the local company at Hickman, Kentucky, owned by H. Cowgill; consideration $2,500, by Chowning & Wright, of this city.

WHITTIER, CAL.—William Partridge has applied to the city council for a franchise. If the franchise is granted Mr. Partridge expects to extend the line to La Habra, Rivera, Norwalk and Downey.

QUINCY, ILL.—The poles are on the ground for two telephone lines that will be constructed in the near future, one from Ambrose, in Hancock county, via La Prairie, and the other from Clayton, via Black's Station.

WINFIELD, KAN.—The city council, at its last meeting, granted a franchise to B. F. Sadil, representing an Independent telephone company composed of

Digitized by Google

local and Independence (Mo.) capitalists.

INDIANA.—The new Brazil Telephone Company has a capital stock of $10,000.

ADA, MINN.—The Ada Telephone Company has been incorporated, with a capital stock of $1,000.

JERSEY, PA.—The Enterprise Telephone Company is building a line from Woodbine to Belle Plain.

MIDDLETOWN, CONN.—Suit has been brought against the People's Telephone Company by D. K. Light.

NORFOLK, VA.—A new telephone company is being organized. It will serve both Portsmouth and Norfolk.

MONMOUTH, ILL.—The Berwick Monmouth telephone line is near completion and will be ready for use soon.

GASTON COUNTY, N. C.—The State charters the Gaston County Telephone Company, with a capital stock of $10,000.

KANSAS CITY, MO.—The El Dorado Springs Telephone Company has been incorporated, with a capital stock of $10,000.

NASHVILLE, TENN.—The Citizens' Telephone & Construction Company has been chartered, with capital stock $10,000.

WAXHAW, N. C.—The Waxhaw Telephone Company has been incorporated for construction of long-distance service to Charlotte.

WARSAW, IND.—The Farmers' & Merchants' Telephone Company, of Warsaw, has increased its capital stock from $10,000 to $15,000.

PHILADELPHIA, PA.—The American Message 'Phone Call Company, of Philadelphia, was granted a charter, with a capital stock of $1,000,000.

DANVILLE, KY.—The Boyle Citizens' Telephone Company has sold its line and franchise to the Cumberland Telephone Company for $3,000.

OTTUMWA, IOWA.—The Ottumwa Telephone Company filed an amendment to its articles increasing its capital stock from $40,000 to $75,000.

PARIS, TEX.—The Southern Telephone Company, with principal office at Lake Creek, has been granted franchise for constructing a system in Paris.

LEXINGTON, KY.—The Cumberland Telephone Company has purchased the telephone systems of Nicholasville, Stanford and Lebanon, for $25,000.

ALLIANCE, NEB.—The work of putting another switchboard at the central telephone office has been accomplished with the assistance of Mr. Harmon.

CUMBERLAND, TENN.—The Cumberland Telephone Company's proposed improvements and new construction, recently reported, will cost about $100,000.

FERGUS FALLS, MINN.—The local telephone company is putting in an underground conduit of twelve ducts. Two cables of 100 and 200 wires each will be put in.

CLEVELAND, OHIO.—Cleveland is promised one of the most efficient telephone exchanges in the State, and it is proposed to have a connection with the long-distance system.

GRAND RAPIDS, MICH.—The Citizens' Telephone Company completed a line which it has been building between Hastings and Lake Odessa and will open business at once.

WESTERVILLE, OHIO.—The proposed new telephone line which will connect Westerville with the surrounding villages, also with farmers at their homes, is now an assured fact.

COALVILLE, UTAH.—Two new wires are being strung from Coalville to Park City by the telephone company, giving Ogden much better communication with Summit County points.

SHIPPENSBURG, PA.—The Fulton and Franklin telephone system has passed into the hands of the Cumberland Valley Telephone & Telegraph Company, which has purchased the entire plant.

DENVER, COLO.—An inspection trip was taken by president Wallace, of the Rocky Mountain Bell Telephone Company to Laramie. It is said that the line from Denver to Salt Lake is now completed and in operation.

BANTA, IND.—The Schance & Fair Electric Company, of Chrisman, Illinois, which owned the telephone plant here, has sold the controlling interest to Ed Van Sickle, of Hillsdale. The latter has formed a company with $13,000 capital.

Digitized by Google

TOULON, ILL.— Cuba, Illinois, is to have a telephone exchange.

OTTAWA, KAN.—The new telephone line between Williamsburg and Ottawa, via Homewood, is now complete.

NATIONAL CITY, CAL.—A telephone cable 4,830 feet long is being laid in the bay between Coronado and San Diego.

GRAND VIEW, ILL.—The Farmers' Telephone Company is building a through line from Kansas to Grand View.

RED LAKE FALLS, MINN.—The local telephone exchange is now open. The switchboard has one hundred drops and all filled up.

ELGIN, ILL. — The Northwestern Telephone Company has secured three hundred contracts for 'phones at Elgin and will build.

PIERMONT, W. VA.— Franchise has been granted for telephone exchange to the Chesapeake and Potomac Telephone Company.

JERSEY CITY, N. J.—The directors of the Telegraph, Telephone & Cable Company have passed a resolution assessing the capital stock 10 per cent.

STANLEY, VA.—The Gaston Telephone Company has been incorporated, with capital stock of $10,000, by H. C. Hunter, E. L. Pegram, Jr., and C. D. Homesley.

MAZOMANIE, WIS.—The Mazomanie Telephone Company has been organized by E. L. Case, D. L. Bestor and T. H. Ward to construct a telephone line to Dodgeville.

BLACK RIVER FALLS, WIS.—The new telephone line being built through the city from Eau Claire to La Crosse is being pushed rapidly, and will be one of the finest lines in this part of the State.

KOKOMO, IND., has two telephone companies. A bitter fight has ensued in which the Bell Company came so near being run out of business that it is making contracts for 50 cents per month.

CHICAGO, ILL.— Directors of the Chicago Telephone Company have declared the regular quarterly dividend of 3 per cent, payable January 2 to stock of record December 26. Transfer books close December 26 and reopen January 3. The stock sold at 237½ on the local exchange recently, with 240 for one share. This is a sharp advance from the price last quoted.

SIKESTON, MO. — Sikeston Telephone Company, of Sikeston, capital stock $12,000, incorporated by George M. Head, Charles H. Sander, John N. Chaney and others.

GENEVA, ALA.— Mr. W. M. Lanier has purchased a switchboard, has contracted for the poles and wires, and work will begin in a few days on a telephone exchange.

LOGANSPORT, IND. — S. P. Sheerin intimates that the telephone company with which he is interested at Indianapolis will shortly petition for a franchise to operate a telephone exchange in this city.

JACKSON, MICH.—A franchise has been introduced into the common council granting to the United States Telephone Company, of Cleveland, Ohio, privileges to carry on a telephone and toll line business.

LOUISVILLE, KY.—The Board of Public Works is getting ready to advertise for the sale of a franchise to operate a new telephone system in Louisville. No bid for less than $10,000 will be received.

DAVENPORT, IOWA.—The directors of the Iowa Telephone Company, recently consolidated with the Central Union, decided to submit to the stockholders a proposition to increase the capital stock of the company from $1,000,000 to $4,000,000.

CONNELLSVILLE, PA.—The Central District and Printing Telegraph Company has issued a circular stating that the cost of service will be put back to the high rates, $36 for offices and $30 for residences. This is an increase of 33 per cent on the rate of the former and 50 per cent on the latter.

HARRISON, OHIO.— Harrison Council has granted a twenty-year franchise to the Harrison Telephone & Exchange Company. The line will extend thro Okeana, New London, Venice, New Baltimore, Miamitown, Elizabethtown and Cleves. R. C. Crampton, of Blanchester, who is now in the employ of the Bell Telephone, will have charge.

Digitized by Google

## Wanted.

COMMENCING WITH THE DECEMBER ISSUE, we will add to our paper want columns, which will appear on this page under the heading of "WANTS." They will be classified under the following heads:

HELP WANTED,
SITUATIONS WANTED,
STOCK WANTED,
CAPITAL WANTED,
EXCHANGES FOR SALE,
MATERIAL FOR SALE and
MISCELLANEOUS WANTS.

The rate under these headings will be seven cents per word.

---

COMPETENT MANAGER wants charge of five hundred to thousand drop telephone exchange. References from present employers, and satisfactory reasons for wanting a change. Address A-1, TELEPHONE MAGAZINE.

---

WANTED—Present address of A. C. Hunt. In July he was in Alamogordo, New Mexico. Address A-2, TELEPHONE MAGAZINE.

---

WANTED—Ladies and gentlemen to introduce the "hottest" seller on earth, Dr. White's Electric Comb, patented 1899. Agents are coining money. Cures all forms of scalp ailments, headaches, etc., yet costs the same as an ordinary comb. Send 50 cents in stamps for sample. D. N. ROSE, General Manager, Decatur, Ill.

---

WANTED—Business men and women to take exclusive agency for a State, and control sub-agents handling Dr. White's Electric Comb; $3,000 per month compensation. Fact. Call, and I'll prove it. D. N. ROSE, General Manager, Decatur, Ill.

---

EDWARD E. CLEMENT. WM. D. GHARKY.

CLEMENT & GHARKY

Patents and Patent Law

GENERAL ELECTRICAL EXPERTS

SEARCHES, REPORTS, OPINIONS

Stephen Girard Building, PHILADELPHIA.
McGill Building, WASHINGTON, D. C.

The Inland Printer

$2.00 per Year.
20c. per Copy.

Published Monthly...

The Leading Trade Journal of the World in the Printing and Allied Industries.

NO matter what line of trade you are in, if you like nice printing or have anything to do with advertising or art work, this magazine will be a most valuable aid. Every issue is a gem. You need it. Send 20 cents for a sample copy. It is worth double that price.

The Inland Printer Co.
PUBLISHERS,
212-214 Monroe Street,
CHICAGO.

---

McRoy conduits are as impervious to water as a duck's back

JOHN T. McROY
302 BROADWAY, NEW YORK
138 WASHINGTON ST., CHICAGO

Digitized by Google

DID YOU RENEW YOUR SUBSCRIPTION?

VOLTA Vol. XVI. No. III. OHM
DECEMBER, 1900.

# Telephone Magazine

ILLUSTRATED.

IN THIS ISSUE

TELEPHONE SWITCHBOARDS (Continued)
By H. P. CLAUSEN.

TALKS AND CROSS-TALKS (Illustrated)
By A. E. DOBBS.

TELEGRAPHS AND TELEPHONES AT THE PARIS EXHIBITION
By J. GAVEY.

RESULTS OF SOME FRENCH EXPERIMENTS IN WIRELESS TELEPHONY

TELEPHONE NEWS

ELECTRICAL ENGINEERING PUBLISHING COMPANY
MARQUETTE BUILDING, CHICAGO.

PRICE, 10 CENTS.

Digitized by Google

INDEPENDENT LOCAL LONG DISTANCE TELEPHONE

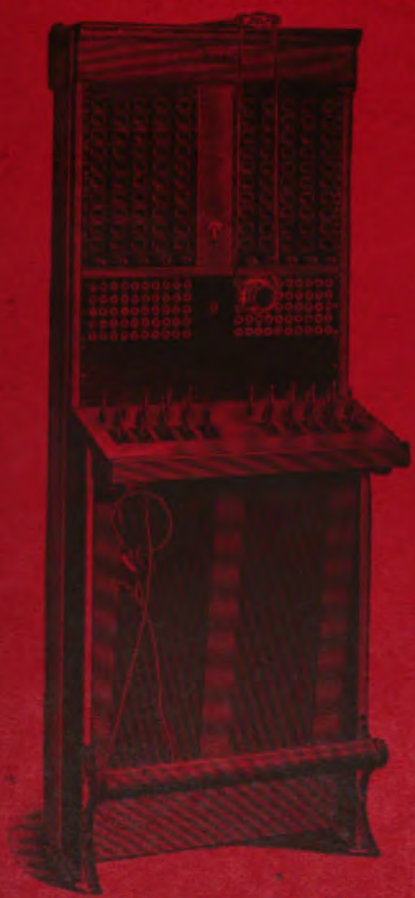
IMPROVED

BELL STYLE and EXPRESS Switchboards.

Improved Tubular Drop.

Cross-Connecting Boards
Cable Terminals

Complete 100-Drop "Express" Switchboard.



100-Section Bell Style Board, Complete.

WE HAVE IN STOCK

10,000 Drops of all Types of Switchboards, including the GENUINE BELL and the ALLEGED BELL STYLE

Price, 15 cents to $1.50 per drop.

These drops have been replaced by our Express Switchboards,

THE STANDARD OF THE WORLD.

Get our prices on either the Improved Bell or Express Boards.

AMERICAN ELECTRIC TELEPHONE CO.

Nos. 36, 38, 40, 42, 44, 46, 48 & 50 JACKSON BOULEVARD, CHICAGO.



Digitized by Google

# Weston Electrical Instrument Co.

## 114 to 120 William Street, NEWARK, N. J., U. S. A.

**PORTABLE....**
**DIRECT READING**

**VOLTMETERS AND WATTMETERS**

**For Alternating and Direct Current Circuits.**

The only standard portable instrument which deserves this name. Absolutely permanent, if not abused.

**PORTABLE DIRECT READING**

**Voltmeters, Milli-Voltmeters.**
**Ammeters, Milli-Ammeters.**

PORTABLE DIRECT READING WATTMETER FOR ALTERNATING AND DIRECT CURRENTS.

**A New Catalogue**
**... ON ...**
**VOLTMETERS, POTENTIAL INDICATORS, AMMETERS,**
**... FOR ...**
**Central Stations and Isolated Plants.**

Highest Accuracy, Least Consumption of Energy.

Correspondence Solicited.

**SEMI-PORTABLE LABORATORY STANDARD VOLTMETERS AND AMMETERS.**

The most accurate and most convenient absolute standard ever offered.

BERLIN — European Western Electrical Instrument Co., Ritterstrasse No. 88. LONDON — Elliott Bros., No. 101 St. Martins Lane.

# CHICAGO EDISON CO.

## DEALERS IN

# ELECTRIC LIGHTING SUPPLIES

## 139 ADAMS STREET

## CHICAGO

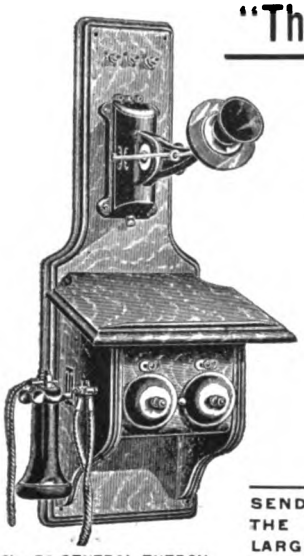



Digitized by Google

# "There is a Reason for Everything."

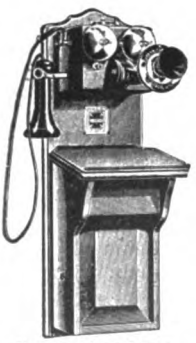
"Why do other manufacturers sometimes underrate Eureka Apparatus."
"That's simple enough."
"Because they fear it more than any other competitor."

**TOLL LINE EQUIPMENT FOR EXACTING CONDITIONS.**



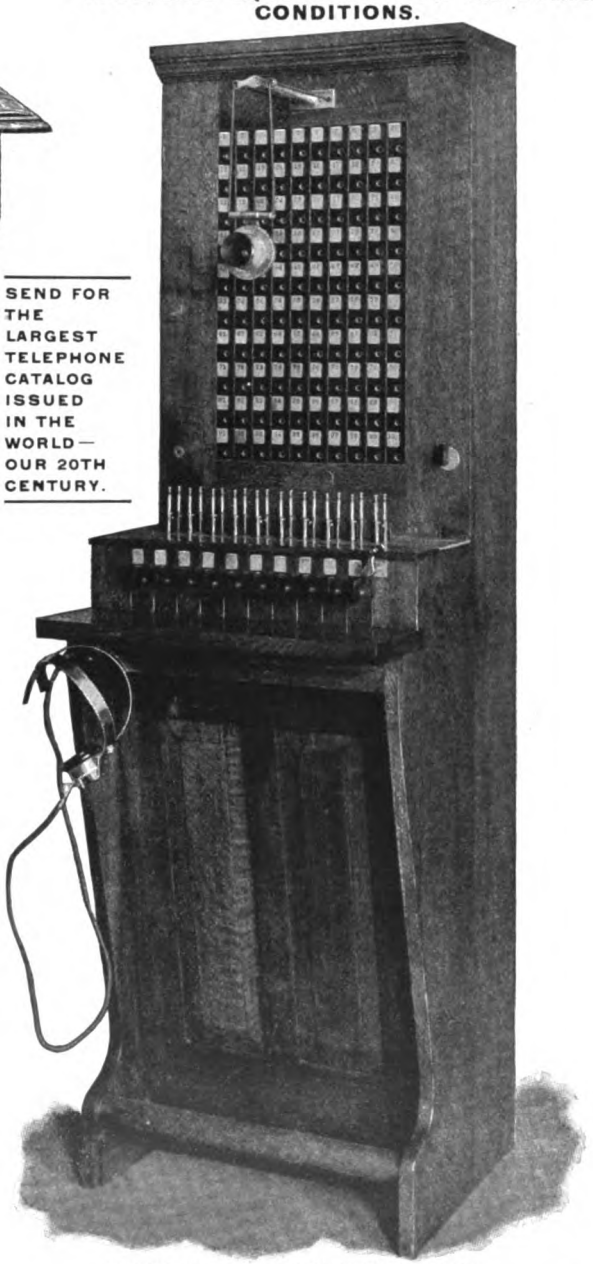
No. 50 CENTRAL ENERGY.

No. 40 BRIDGING OR SERIES.



No. 49 AUTOMATIC CALLING.

SEND FOR THE LARGEST TELEPHONE CATALOG ISSUED IN THE WORLD— OUR 20TH CENTURY.



EUREKA METALLIC EXPRESS SWITCHBOARD.

No. 91 20TH CENTURY TELEPHONE.

No. 33 DESK SET.

No. 51.

No. 59 PROTECTOR.

INDEPENDENT LOCAL AND TELEPHONE LONG DISTANCE SYSTEM

OFFICIAL DESIGN.

**COMPLETE HIGH-GRADE EQUIPMENT.**

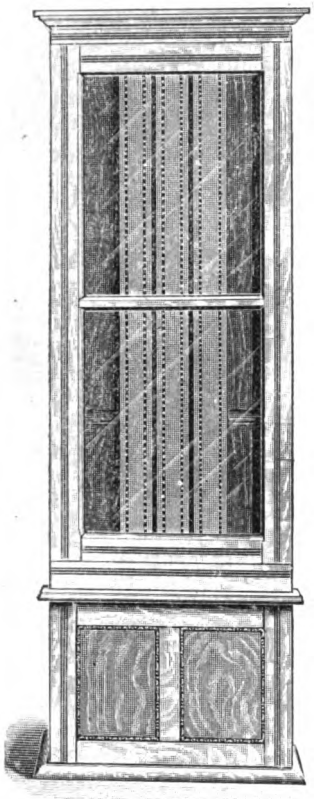
PRICES RIGHT.

## EUREKA ELECTRIC CO.

157-167 S. CANAL ST. CHICAGO, ILL., U. S. A.

**Please mention TELEPHONE MAGAZINE in writing to advertisers.**


Digitized by Google



# STANDARD Telephone & Electric Company

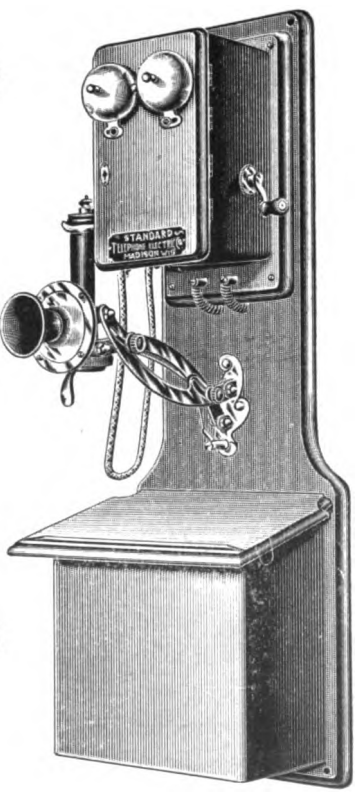
## MADISON, WIS.

*MANUFACTURERS AND IMPORTERS*

**Telephones of Value.**
**Switchboards Unexcelled.**
**Auxiliary Apparatus**
**of Every Description.**

**Our Exhibit at the Paris Exposition Is Awarded Another Medal because of**

**Quality and Workmanship.**




# Special Apparatus

**FOR**

**LONG LINES,**
**SHORT LINES,**
**FARMERS' LINES,**
**AND ALL LINES OF BUSINESS**

*WRITE FOR CATALOGUE.*

**Please mention TELEPHONE MAGAZINE in writing to advertisers.**

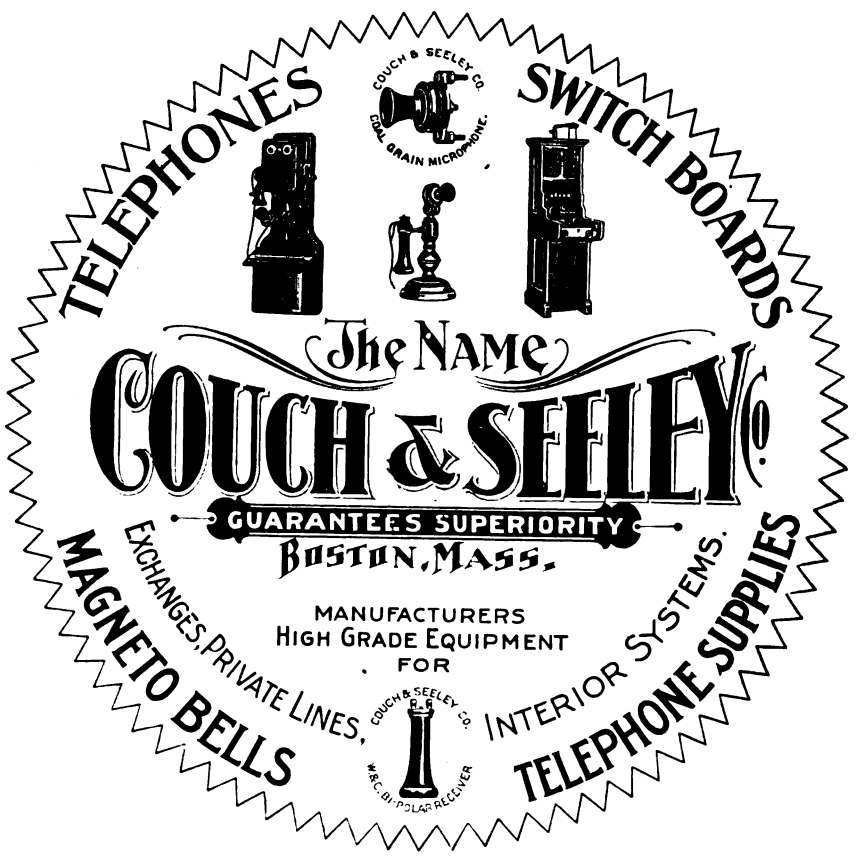
Digitized by Google

# INDEX TO ADVERTISEMENTS.


| | PAGE |
|---|---|
| American Battery Compound Co. | IX |
| American Elec. Fuse Co.—Fuses and Protectors | XXVII |
| Allis, E. P., Co.—Engines and Boilers | XVIII |
| American Battery Co.—Telephone Batteries | XV |
| American Electric Telephone Co.—Telephone Apparatus | II |
| American Electric Telephone Co.—Switchboards | XI |
| American Electric Telephone Co.—Switchboards | XII |
| American Electric Wire Co.—Magnet Wire | XVIII |
| Big Four Railroad | XXI |
| Brown, Charles A., & Cragg—Patents | 248 |
| Carter-Mann Lumber Co. | XV |
| Central Electric Co.—Telephone Supplies | XXXII |
| Central Mfg. Co.—Cross-Arms, Pins and Molding | XV |
| Central Telephone & Electric Co.—Telephones | XXII |
| Century Telephone Construction Co. | VIII |
| Chicago Edison Co.—Wires and Supplies | III |
| Chicago Plating & Enameling Co. | XVIII |
| Clement & Gharky | 248 |
| Couch & Seeley Co.—Telephones | VI |
| Cream Flux Co.—Soldering Flux | XVIII |
| Dr. White Electric Comb Co. | XXVIII |
| Electric Appliance Co.—Telephone Material | XVIII |
| Electrical Engineering Pub. Co.—Announcement | XXIV |
| Electrical Engineering Pub. Co.—Binders | XXI |
| Electrical Engineering Pub. Co.—Publishers | XIX, XXV, XXVI, XXVII |
| Electrical Review, The—Newspaper | XXV |
| Electricity (London)—Newspaper | XXIX |
| Ericsson Telephone Co.—Microphones | XV |
| Eureka Electric Co.—Telephones and Switchboards | IV |
| Exchanges for Sale | 248 |
| Farr Tel. & Construction Supply Co.—Telephones | XX |
| Fowler—Poles | XV |
| Gordon Battery Co.—Batteries | XX |
| Help Wanted | 248 |
| Hipwell Mfg. Co—Telephones, Transmitters | VII |
| Holtzer-Cabot Electric Co., The—Telephone Apparatus | VIII |
| Independent Telephone Supply Co.—Supplies | XV |
| Inland Printer Co.—Publishers | 248 |

| | PAGE |
|---|---|
| International Correspondence School | XXI |
| Kellogg Switchboard and Supply Co.—Switchboards | XII |
| Keystone Electric Telephone Mfg. Co.—Telephones | XXVIII |
| King, P. S., & Son—Publishers | XXI |
| Klein, M., & Son—Climbers | XV |
| Laughlin Mfg. Co.—Fountain Pens | XXII |
| Materials for Sale | 248 |
| McCance Brothers Co. | XXIX |
| McDermid Mfg. Co.—Magnet Wires | XVIII |
| McRoy, J. T.—Conduits | 248 |
| Metropolitan Electric Co. | XXIX |
| Mianus Electric Co.—Telephones | XX |
| Miscellaneous Wants | 248 |
| Monon Railway | XXI |
| North Electric Co.—Telephones and Switchboards | XIV |
| Northwestern Tel. Mfg. Co.—Switchboards | XXVIII |
| Okonite Co.—Wires, Cables, Conductors | XXVIII |
| Pumpelly Storage Battery Works | XV-XXVIII |
| Situations Wanted | 248 |
| Smith, O. W.—Poles | XXII |
| Southern Electrical Co—Telephones | XXII |
| Standard Telephone & Electric Co.—Telephone Apparatus | V |
| Standard Underground Cable Co.—Conductors | XVIII |
| Sterling Electric Co.—Switchboards | XVI |
| Sterling Electric Co.—Telephones | XVII |
| Stock Wanted | 248 |
| St. Louis Finance Publishing Co.—Newspaper | XXV |
| Stromberg-Carlson Tel. Mfg. Co.—Switchboards | XXX |
| Stromberg-Carlson Tel. Mfg. Co.—Telephone Apparatus | XXXI |
| Sun Electric Manufacturing Co—Tel. Apparatus | XII |
| Swedish-American Tel. Co—Telephones | XXVIII |
| TELEPHONE MAGAZINE—Reading Offer | XXIII |
| Torrey Cedar Co—Poles | XV |
| Victor Telephone Works—Telephones | XXIX |
| Weston Elect Instrument Co.—Testing Instruments | III |
| Western Electrical Supply Co.—Telephones | XIII |
| Western Tel. Construction Co.—Tel. Apparatus | VII |
| Worcester, C H., Co.—Poles | XX |









Digitized by Google

J. H. VAN VLISSINGEN, PRESIDENT.
L. G. WHEELER, VICE-PRESIDENT
W. C. HEINROTH, TREASURER.
L. G. BOWMAN, SEC'Y AND GEN'L MANAGER.

# WESTERN TELEPHONE CONSTRUCTION CO.

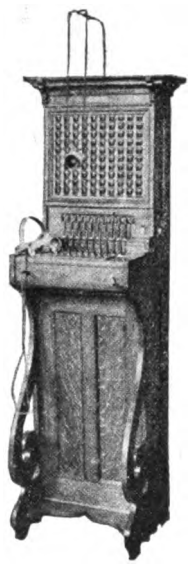
153-159 SOUTH JEFFERSON STREET, CHICAGO, ILL.

WESTERN EXPRESS SWITCHBOARDS ARE THE BEST.

THEY ARE RELIABLE. GIVE QUICKEST SERVICE.

WESTERN EXPRESS DROPS ARE SELF-RESTORING AND CAN BE REMOVED AND OTHERS SUBSTITUTED IN LESS THAN A MINUTE.

SUBSCRIBERS ARE NOT INCONVENIENCED WHEN CHANGES ARE MADE.



100 LINE BOARD

WESTERN EXPRESS SWITCHBOARDS CAN BE USED FOR FULL METALLIC OR COMMON RETURN LINES, OR BOTH.

THEY ARE EQUIPPED WITH TUBULAR CLEARING-OUT DROPS. ALSO WITH OUR NEW RINGING AND LISTENING KEYS. ALL APPARATUS GUARANTEED.

WRITE FOR PRICES.

ORDERS FILLED PROMPTLY.

# A NEW DEPARTURE IN DESK SETS

## Generator, Ringer and Induction Coil all in the Base.

*A Neat, Attractive and Efficient Desk Set.*

ORDER A SAMPLE.

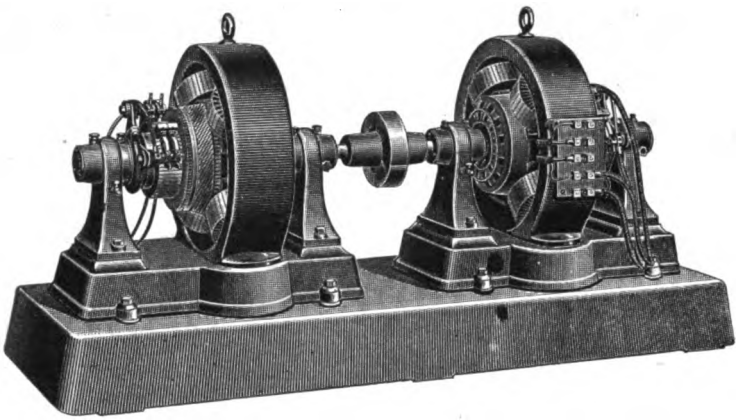
# HIPWELL MFG. CO.

ALLEGHENY, PA.

Please mention TELEPHONE MAGAZINE in writing to advertisers.

Digitized by Google

# YOU CAN'T HEAR IT BUT IT'S THERE



**The H.-C. Telephone Dynamo for direct connection to transmitter circuit. No noise audible due to commutation; can be used without storage battery; the only thing to use for common battery system. We should be pleased to send full particulars on application. We also manufacture a complete line of Power Generators and Motors for telephone service, either for charging storage batteries or operating signals. If you will tell us what you wish to do in the way of signaling, we can tell you of a machine that will produce the results desired by you to the best advantage.**

CHICAGO OFFICE:
397 Dearborn St.

**The Holtzer-Cabot Electric Co.**
**BOSTON (Brookline), MASS.**

# NEW CENTURY Desk Telephone

Write us for samples and lowest prices.

Correspondence solicited.

Catalogue furnished on application.

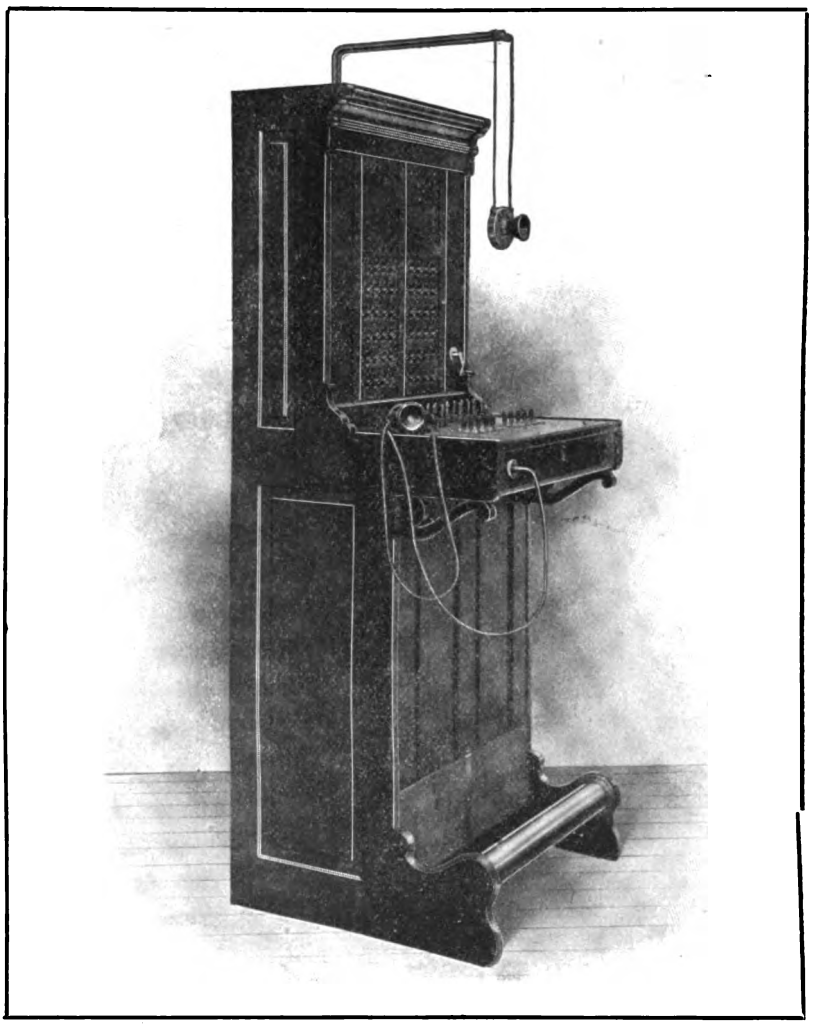
We guarantee in this desk set a more efficient, more symmetrical and better formed instrument than any other on the market. Each instrument is fitted with New Century Long-Distance Transmitter, Double Pole Receiver, and is furnished with or without Magneto.

## Century Telephone Construction Co.

**CLEVELAND, - - OHIO**

**Please mention TELEPHONE MAGAZINE in writing to advertisers.**


Digitized by Google



# The Kellogg "Express" Switchboard

Shown in this cut, is designed for use with the Magneto System in small exchanges. It has a capacity of 150 lines, and is equipped with our combination self-restoring drops and jacks, the drops being so arranged as to be entirely cut out of the talking circuit. The woodwork is oak or mahogany as desired. All wiring is brought down to the connecting rack ready for connecting the line wires.

## Kellogg Switchboard & Supply Co.

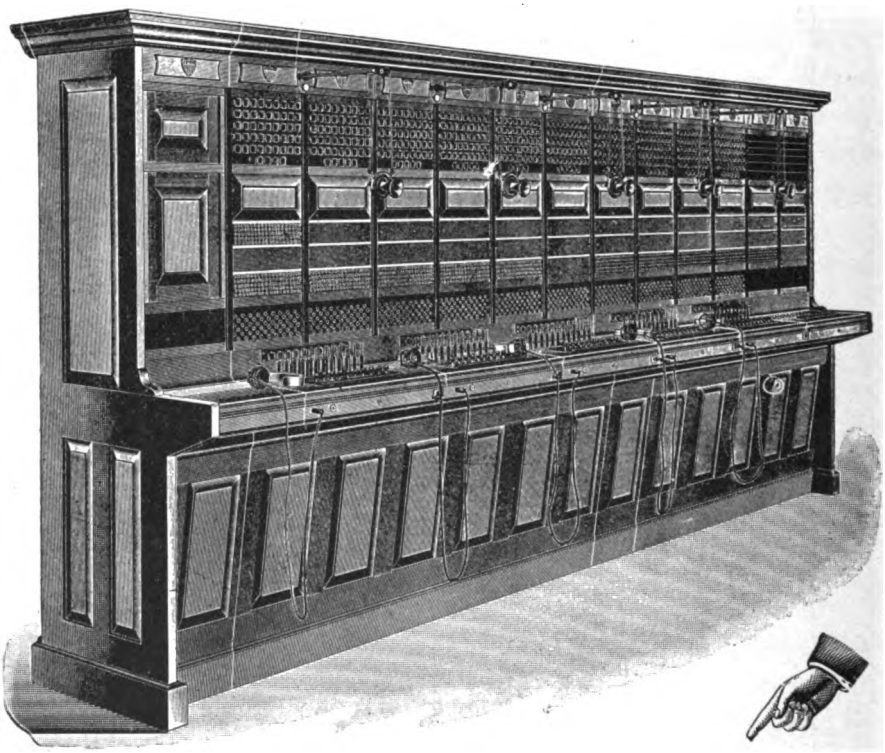
227 SOUTH GREEN STREET, CHICAGO, ILL.



Digitized by Google

INDEPENDENT
LOCAL AND LONG DISTANCE
TELEPHONE

# THE NINETEEN HUNDRED
REPRESENTS THE
# High-Grade Tele
EVER PLACED UPON



WE FURNISH
## Complete Exchange
EITHER MAGNETO CALL
WITH OUR ORIGINAL RELAY-

INDEPENDENT
LOCAL AND LONG DISTANCE
TELEPHONE

ADDRESS
## AMERICAN ELECTRIC
36, 38, 40, 42, 44, 46, 48 and 50 Jackson

Please mention TELEPHONE MAGAZINE in writing to advertisers.

Digitized by Google

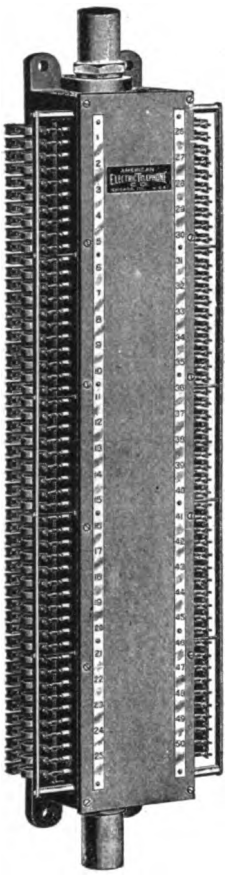
# AMERICAN APPARATUS

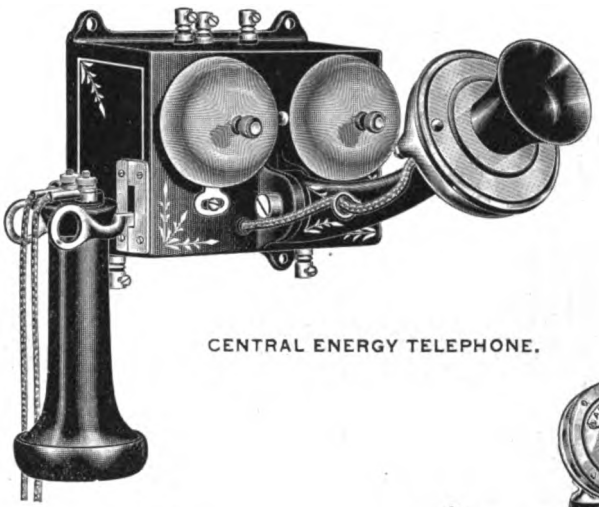
HIGHEST TYPE OF

# phone Devices

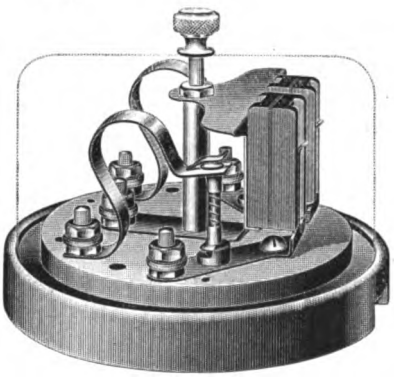
THE AMERICAN MARKET.

INDEPENDENT LOCAL AND LONG DISTANCE TELEPHONE





CENTRAL ENERGY TELEPHONE.



No. 41. NEW STYLE DESK SET.

## Equipment, arranged for

OR CENTRAL ENERGY,

## LAMP SIGNAL SYSTEM.

INDEPENDENT LOCAL AND LONG DISTANCE TELEPHONE

# TELEPHONE COMPANY

Boulevard, CHICAGO, ILL., U. S. A.




Digitized by Google

# SUN

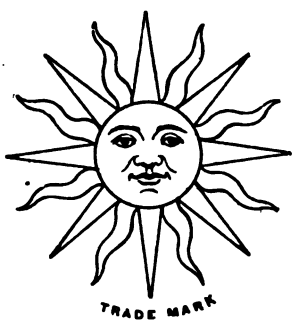
## ELECTRIC MANUFACTURING CO.

## TELEPHONES AND SWITCHBOARDS

---

## SUPERIOR POINTS

**CLEMENT-GHARKY SWITCHBOARDS**




**CLEMENT-GHARKY TELEPHONES**

---

**SUN ELECTRIC MANUFACTURING CO.**

**Clement-Gharky Telephones and Switchboards.**

HOME OFFICE,
301 Market Street,
CAMDEN, N. J.

SALES OFFICE, 1205 Stephen Girard Building.
FACTORIES, Memphis and Tioga Streets.
PHILADELPHIA, PA.




Digitized by Google

PROSPECTIVE PURCHASERS

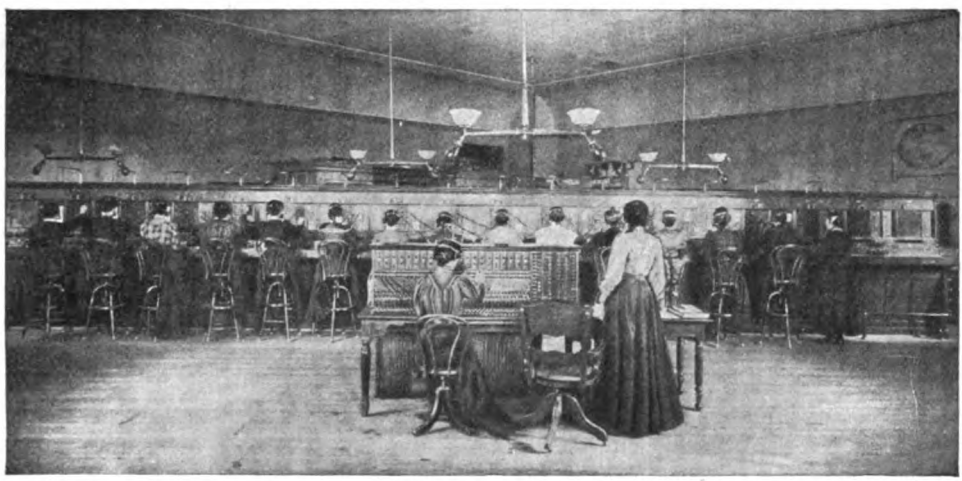
WHO RECOGNIZE

HIGH-GRADE APPARATUS

WILL APPRECIATE

WESTERN TELEPHONE CONSTRUCTION CO'S

TELEPHONE EQUIPMENT



A WESTERN TELEPHONE CONSTRUCTION CO. EXCHANGE, NEWARK, N. J.

ESTIMATES ON LARGE OR SMALL "EXCHANGES" PROMPTLY SUPPLIED

Central Energy or Magneto Call

WESTERN ELECTRICAL SUPPLY CO.

GENERAL SALES AGENTS

ST. LOUIS, MO.

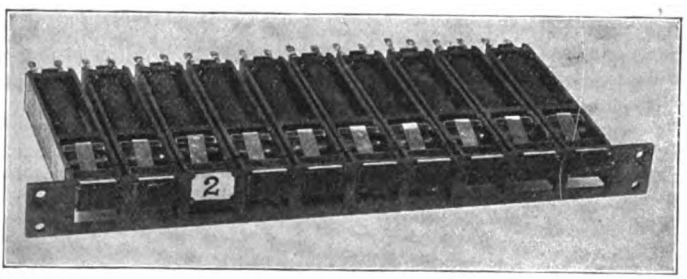



Digitized by Google

# THE NORTH SUPERVISORY SYSTEM

IS A

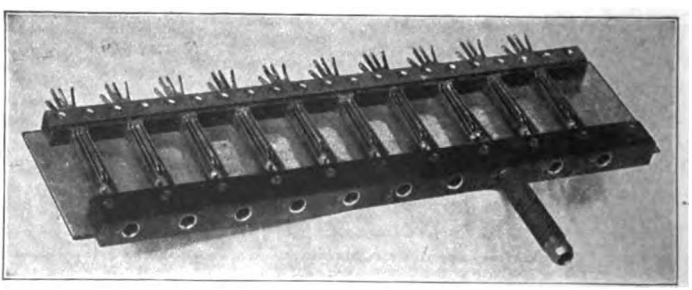
# DIVIDEND PAYER



AUTOMATIC LINE SIGNAL.

Saves 50% in Operators' Salaries.

Platinum Contacts.
Rubber Insulation.
Automatic Signals.
Double Supervision.
Line Jack in banks.
Primary Batteries.
No turning the crank.
Arranged for Multiples.



LINE JACK.

For particulars, write to

The North Electric Co.,

561-573 Frankfort Street. CLEVELAND, OHIO.




Digitized by Google

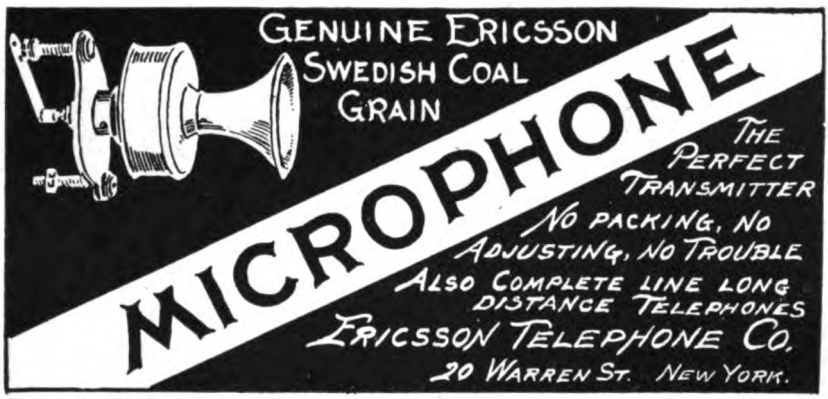
# Agents Wanted!

Something New!
TELEPHONE DIRECTORY HOLDERS

SELLS AT SIGHT EVERY SUBSCRIBER NEEDS ONE

Telephone employes can sell them everywhere
Send 25c for sample, etc., to

CARTER-MANN CO., MANSFIELD, OHIO




# WIRE

Our Specialty—"MONARCH" Galvanized Telephone Wire.
Also, Genuine Ex. B. B. and B. B. "BOSTON" Cable Hangers.
Crosby Clips. Turnbuckles. Galvanized Steel Strands.

INDEPENDENT TELEPHONE SUPPLY CO.
19 & 21 SOUTH CANAL STREET, - - - CHICAGO.

## CENTRAL MANUFACTURING CO. CHATTANOOGA, TENN.

MANUFACTURERS AND DEALERS IN

YELLOW PINE CROSS-ARMS, LOCUST PINS, OAK PINS, ELECTRICAL MOULDINGS, OAK BRACKETS.

Large stocks on hand. Delivered prices quoted, F.O.B. cars your city, in any quantity. Write us.

# Cedar TORREY CEDAR CO. Poles

CLINTONVILLE, WIS.

*WRITE FOR DELIVERED PRICES.*

## CEDAR POLES

50 FT. TO 100 FT. A SPECIALTY.
JOHN H. FOWLER
1705 Fisher Bldg., CHICAGO.

## KLEIN'S CLIMBERS

Connectors', Linemen's and Construction Tools
Catalogue Free. Send for one
MATHIAS KLEIN & SON,
87-89 W. Van Buren St., Chicago, Ills.

## We Make Storage Batteries

High-Tension Sets for Telephone Work

Batteries installed by us for Chicago Telephone Co. seven years ago still in use. Write for prices and particulars.

PUMPELLY STORAGE BATTERY WKS.
329 Dearborn St., Chicago, Ill.

## "American" STORAGE CELLS ARE THE BEST.

Send for descriptive circular.

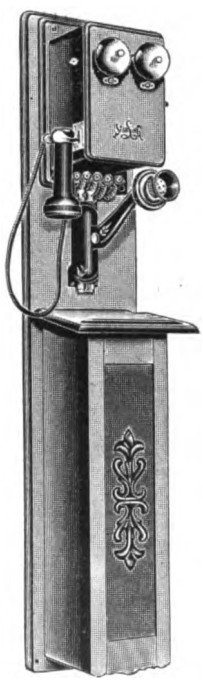
THOUSANDS IN USE FOR TELEPHONE WORK.

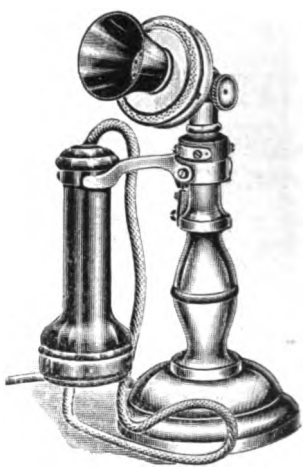
AMERICAN BATTERY CO., 170 S. Clinton St. Chicago, Ill.
ESTABLISHED 1889.

Please mention TELEPHONE MAGAZINE in writing to advertisers.


Digitized by Google

# SOME O
# LEADING S
# TELEP





*Write for Catalogue and Prices.*

# STERLING ELEC

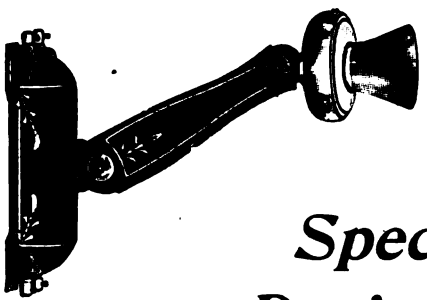
*LA FAYE*

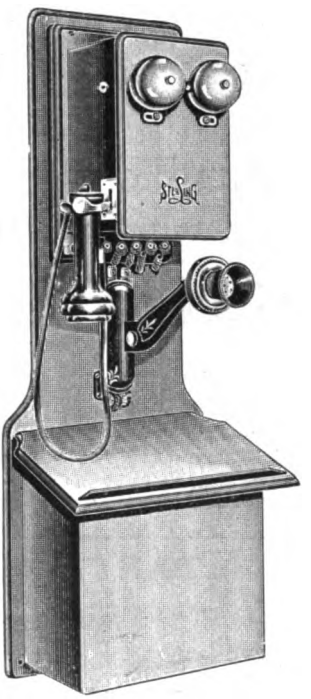
**Sales Office, 1260 MONADNOCK**




Digitized by Google

# F OUR TYLES OF HONE





*Special Designs on Application.*

# TRIC COMPANY,

*TTE, IND.*

BUILDING, CHICAGO, ILLINOIS.




Digitized by Google

Willard L. Candee, H. Durant Cheever, } Managers.

1889, Paris Exposition—Medal for Rubber Insulation.
1893, World's Fair—Medal for Rubber Insulation.

Geo. T. Manson, Gen. Supt.
W. H. Hodgins, Secretary.

OKONITE TRADE MARK

THE OKONITE CO., Ltd.,
SOLE MANUFACTURERS OF
OKONITE WIRES, OKONITE TAPE, MANSON TAPE
CANDEE WEATHERPROOF WIRES.
258 Broadway. NEW YORK.

TESTING INSTRUMENTS

FOR TELEPHONE AND TELEGRAPH WORK

ELDREDGE POCKET BATTERY VOLTMETER

WHITNEY POCKET BATTERY VOLTMETER

WE SEND FULL INFORMATION

ELECTRIC APPLIANCE COMPANY, CHICAGO

THE McDERMID MFG. CO.

FINE SIZES, SINGLE-COVERED SILK

MAGNET WIRES

Electro-Magnet Winding for the Trade—a Specialty

207 South Canal Street, - CHICAGO.

THE EDWARD P. ALLIS CO.
MILWAUKEE WISCONSIN
SOLE BUILDERS OF THE
REYNOLDS CORLISS ENGINE
STREET RAILWAY AND ELECTRIC LIGHT ENGINES A SPECIALTY

STANDARD UNDERGROUND CABLE CO.

BARE WIRE, INSULATED WIRE, CABLES.

Wire Cables and Accessories for Telephone use, a specialty.

FOR PRICES AND INFORMATION, ADDRESS,

PITTSBURG, Westinghouse Bldg. NEW YORK, 55 Liberty St. PHILADELPHIA, 1225 Betz Bldg. CHICAGO, 542 Rookery. SAN FRANCISCO. Mills Bldg.

Factories: Pittsburg, Pa., Oakland, Cal., Perth Amboy, N. J.

THE CHICAGO PLATING & ENAMELING CO.

W. L. Bower, Pres. Frank E. Rugg, Sec'y

ORNAMENTAL JAPANNING FINE COLOR ENAMELING

High-Grade Electro-Platers and Enamelers

Fine Nickel Plating. Electro-Plating in Gold, Silver, Copper, etc. Oxidizing in Copper, Brass and Silver. Polishing, Bronzing, Lacquering. PHONE MAIN 4784

166-174 SOUTH CLINTON ST., CHICAGO

CREAM FLUX

A Non-Corrosive Insulating Soldering Flux for All Metals

For Sale by All Supply Houses, or

CREAM FLUX CO., 100 Washington St., Chicago

SOLE MANUFACTURERS

AMERICAN ELECTRIC WIRE CO.

Fine Sizes Silk and Cotton Magnet Wires.

ELECTRO-MAGNET WINDING FOR THE TRADE.

TELEPHONE INDUCTION COILS A SPECIALTY.

71 W. Jackson Boulevard, . . . CHICAGO.



Digitized by Google

# The Inspector AND Trouble Man

**Full of information and diagrams for**

OPERATOR, THE INSPECTOR,
EXCHANGE OWNER, TROUBLE MAN,
EXCHANGE MANAGER, LINEMAN.

**A Complete Description of Telephones and Their Troubles. How to Find and Remedy Them, together with Working Plans for Exchange Construction, complete with Diagrams of all the up-to-date Telephones and Switchboards.**

THE ONLY BOOK IN PLAIN LANGUAGE. A VOLUME FOR ANY ONE INTERESTED IN TELEPHONY.

**We will mail this book anywhere upon receipt of price,**

## ONE DOLLAR.

NO TECHNICALITIES. SUBSTANTIALLY BOUND IN CLOTH

## Electrical Engineering Publishing Co.

MARQUETTE BUILDING, CHICAGO, U. S. A.

Please mention TELEPHONE MAGAZINE in writing to advertisers.


Digitized by Google

Price...
$5.00

# Telephones

As shown in cut, but with backboard and single battery box, $5.75; with swinging arm and double battery box, $7.75.

Send for complete catalogue of

MAGNETO BELLS,
MEDICAL BATTERIES and
ELECTRIC SPECIALTIES.

All Goods High Grade in Every Respect.

**Mianus Electric Co.**
MIANUS, CONN.

# Gordon Primary Cells

Gordon cells are being daily installed on the Selective Telephone System. Ask the Stromberg-Carlson Telephone Manufacturing Company, the Delaware and Atlantic Telephone and Telegraph Company, and others who have Gordon cells, how they like them. Write us for particulars if you need an efficient primary cell for telephone uses. For Switchboard Transmitters the Gordon cell is the most efficient, economical in maintenance, and most reliable.

TYPES AND CAPACITY OF GORDON PRIMARY CELLS

| | | |
|---|---|---|
| No. 2 | —Size 4½ x 6 in. | Capacity, 100 Ampere Hours. |
| No. 1 | —Size 6 x 8 in. | Capacity, 300 Ampere Hours. |
| No. 1A | —Size 5 x 11 in. | Capacity, 300 Ampere Hours. |
| "H" | —Size 5½ x 7 in. | Capacity, 175 Ampere Hours. |
| "B" | —Size 7½ x 13½ in. | Capacity, 600 Ampere Hours. |
| "C" | —Size 8½ x 14½ in. | Capacity, 1000 Ampere Hours. |

The E. M. F. of each of the above cells, under closed circuit conditions, for telephone work, is Seven-tenths Volt.

For full particulars, testimonials, catalogues, price lists, etc., apply to

**Gordon Battery Company,**
594 Broadway, New York City.

TOLL-LINE POLES A SPECIALTY

# CEDAR POLES

WE OWN ELEVEN YARDS WHICH ARE STOCKED EVERY WINTER WITH POLES CUT ON OUR OWN LANDS.

**C. H. WORCESTER CO., MARINETTE, WIS.**

# ATTENTION

GALV. IRON WIRE No. 14

| | | | |
|---|---|---|---|
| Ton lots, per 100 lbs. | $3.80 | Pins, oak, per 1,000 | $7.00 |
| No. 12, ton lots, per 100 lbs | 3.65 | Cross-arms, per foot | 3½c. |
| Brackets, oak, per 1,000 | 12.00 | Porc. Knobs, No. 4, per 1,000 | $9.00 |

INDEPENDENT EXCHANGES, CAN FILL YOUR ORDERS PROMPTLY. WE GUARANTEE OUR GOODS TO BE FIRST-CLASS, HIGH-GRADE GOODS AT LOW PRICES.

**FARR TELEPHONE AND CONSTRUCTION SUPPLY CO.**
357 Dearborn Street SEND FOR CATALOGUE CHICAGO

Please mention TELEPHONE MAGAZINE in writing to advertisers.


Digitized by Google

*With several hundred illustrations. Prices, in paper cover, 2s. 6d; cloth, 5s. and half morocco, 6s. 6d. Postage, 6d. extra.*

## A Scientific Engineering Record

...OF THE...

# Paris Exhibition 1900

SPECIAL NUMBER OF THE ENGINEERING TIMES.

This work is the most complete Civil, Mechanical and Electrical Engineering record of the exhibits of all nations represented at the Exhibition. It is produced with the aim of showing in a concise form what the best practice of the different nations is in the various departments of engineering. It is copiously illustrated with photographs and drawings, and with each number are presented several full-page colored supplements, while the whole is printed in the best possible style on art paper. It contains signed articles by eminent writers, and some idea of the nature and extent of this work will be gained from the following, which is a partial list of the machinery illustrated and described: Pumps, cranes, metal-working, milling and stone-working machinery, fans and blowers, weighing machines, measuring instruments, steam rollers, railway plant, transporters, steam, gas, oil and hot-air engines, power hammers, injectors, steam packings, roller bearings, tramway and light railway plant conveyors, electrical, wood-working, agricultural, mining and quarrying machinery, pneumatic tools and machinery, automatic and other presses, blast furnace power machinery, mineral water machinery.

PUBLISHERS...

**P. S. KING & SON,**

**2 and 4 Great Smith St.,**

**WESTMINSTER, - LONDON, S. W.**

# BIG FOUR ROUTE

**Chicago** To { Indianapolis, Cincinnati, Louisville, The South and Southeast.

Peoria, St. Louis, Indianapolis, Cincinnati, Louisville, } To *NEW YORK AND THE EAST.*

W. P. DEPPE, A. G. P. and T. A., CINCINNATI.

W. J. LYNCH, G. P. and T. A., CINCINNATI.

J. C. TUCKER, Gen. Nor. Agt., 234 Clark Street, CHICAGO.

**Instruction by Mail in Telephony**

The course is thorough, comprehensive and reliable. Beginning at the fundamental principles of sound, it takes the student through the theory of multiplex systems, from the construction of the simplest private line through the complexities of multiple switchboards.

**Telephony and Telegraphy Courses in charge of H. S. WEBB, M. S., formerly of Lehigh University**

Courses in all branches of Electrical, Mechanical and Civil Engineering. Established 1891. Over 130,000 students and graduates. Capital $1,500,000. Send for circular, stating subject in which you are interested.

**THE INTERNATIONAL CORRESPONDENCE SCHOOLS**
**Box 1180, Scranton, Pa.**

# BINDERS

For preserving your Copies of

*Telephone Magazine*

Will be sent postpaid for

**50 cents in stamps.**

STRONG, SIMPLE, DURABLE.

Will hold six months' or a year's numbers.

**SEND FOR ONE.**

**Electrical Engineering Publishing Co.**

MARQUETTE BLDG., CHICAGO.




Digitized by Google

# EVERYTHING USED WITH TELEPHONES

**Complete Stock. Low Prices. Quick Shipments.**

*We manufacture strictly high-grade*

Long-Distance and Exchange Telephones
Exchange and Toll-Line Switchboards

COMPLETE LINE

*Fuse and Carbon Distributing and Cross-Connecting Boards.*

SEND FOR CATALOGUE.

**Central Telephone & Electric Co.**
909 Market Street, ST. LOUIS, MO.

---

# Southern Electrical Co.

**NASHVILLE, TENN.**

# Telephones

AND ELECTRICAL APPLIANCES OF ALL KINDS.

## Cypress Cross-Arms,
## Locust Pins,
## Oak Brackets,
## Cross-Arm Braces.

Get our prices. Satisfaction guaranteed.

**SOUTHERN ELECTRICAL CO.**
**NASHVILLE, TENN.**

---

# EXCHANGE MANAGERS SUPERINTENDENTS and INSPECTORS

SHOULD USE A

# LAUGHLIN

## FOUNDATION PEN

## The Best at Any Price

A Seasonable Suggestion—A gift of never ending usefulness and a constant pleasant reminder of the giver.

**Your choice** of these popular styles, superior to the

**$3.00 STYLES**

of other makes, for only

# $1.00

**Try it a week.** If not suited we buy it back, and offer you **$1.10.** We are willing to take chances on you wanting to sell, we know pen values, you will when you own one of these.

Finest quality hard rubber holder, 14k. Diamond Point Gold Pen, any desired flexibility in fine, medium or stub, and the only perfect ink feed.

**One Pen Only** to one address on this special offer, by mail, postpaid on receipt of **$1.00,** (registration 8c. extra.)

Ask your dealer to show you **this** pen, if he has not or won't get it for you (do not let him substitute an imitation, on which he can make more profit) send his name and your order to us, and receive **free of charge** one of our Safety Pocket Pen Holders.

Remember — There is no "Just as good" as the **Laughlin,** insist on it, take no chances.

Address—

**LAUGHLIN MFG. CO.**
**267 Laughlin Block,**
**DETROIT, - MICHIGAN.**

---

# C. W. Smith
PRODUCER
# CEDAR POLES
840 Temple Court Building, CHICAGO, ILL.




Digitized by Google

# OUR READING OFFER FOR 1901

| Regular Price. | | Our Offer. |
|---|---|---|
| $9.50 | Telephone Magazine, Success, Current Literature, McClure's, Review of Reviews, Home Magazine | $5.00 |
| 9.50 | Telephone Magazine, Success, Current Literature, McClure's, Review of Reviews, Cosmopolitan (Review of Reviews must go to a new subscriber.) | 5.00 |
| 7.00 | Telephone Magazine, Success, Current Literature, McClure's and Home Magazine | 4.25 |
| 7.00 | Telephone Magazine, Success, Current Literature, McClure's and Cosmopolitan | 4.25 |
| 7.00 | Telephone Magazine, Success, Current Literature, McClure's and Pearson's | 4.25 |
| 7.00 | Telephone Magazine, Success, Current Literature, Cosmopolitan and Home Magazine | 4.00 |
| 7.00 | Telephone Magazine, Success, Current Literature, Pearson's and Home Magazine | 4.00 |
| 7.00 | Telephone Magazine, Success, Current Literature, Pearson's and Cosmopolitan | 4.00 |
| 6.00 | Telephone Magazine, Success, Current Literature and McClure's | 3.75 |
| 6.00 | Telephone Magazine, Success, Current Literature and Home Magazine | 3.50 |
| 6.00 | Telephone Magazine, Success, Current Literature, Cosmopolitan or Pearson's (Review of Reviews, new subscriptions, will be sent in place of Current Literature in any of the above combinations.) | 3.50 |
| 4.00 | Telephone Magazine, McClure's, Home Magazine, Success | 3.25 |
| 4.00 | Telephone Magazine, McClure's, Cosmopolitan, Success | 3.25 |
| 4.00 | Telephone Magazine, McClure's, Pearson's, Success | 3.25 |
| 3.00 | Telephone Magazine, McClure's and Success | 2.75 |
| 3.00 | Telephone Magazine, Home Magazine and Success | 2.50 |
| 3.00 | Telephone Magazine, Cosmopolitan and Success | 2.50 |
| 3.00 | Telephone Magazine, Pearson's and Success | 2.50 |

MAIL A MONEY OR EXPRESS ORDER TO

*Telephone Magazine*

**Marquette Building.** **CHICAGO, ILL.**




Digitized by Google

"I ENJOY your magazine very much and consider it the best in the Independent field." H. B. SALE.

# IF THE BEST IS GOOD ENOUGH FOR YOU

YOU WILL BE SATISFIED WITH THE

# *Telephone Magazine*

THE ONLY TELEPHONE PAPER PUBLISHED IN THE WORLD

---

**EACH NUMBER** contains some interesting and instructive articles on

**Exchange Construction and Operation, Telephone Apparatus, Switchboards, Toll Lines, Line Construction, Protective Devices, Central Energy and Other Systems, Telephone Troubles**

AND A MONTHLY DIGEST OF

## Telephone and Kindred Patents.

---

EIGHT CENTS a month pays for the best Telephone Paper, or a DOLLAR BILL,

WILL BRING THE PAPER REGULARLY FOR A YEAR.

---

NEWSDEALERS SELL IT. SAMPLE COPY FOR STAMP.

---

Address *Telephone Magazine*

Marquette Building, CHICAGO, U. S. A.



Digitized by Google

# Finance

EDITED BY
ROBERT S. DOUBLEDAY.

*A Monthly Review of the Financial, Industrial and Development Interests of the Great West.*

It is the only journal of its class published in the West.

It has a greater circulation therein than any other financial publication.

It is read by the investing, banking, mining and development classes.

Prosperity is abroad in this vast section called the Southwest, which has a population of 20,000,000.

The enormous crops of the past year, sold at phenomenal prices, have made this section rich in ready money.

Bank deposits have nearly doubled in the last twelve months.

If you wish to be informed of the financial and business events of this, the richest portion of our country in natural wealth, and soon to be in developed wealth, read **FINANCE.**

If you want to do business with these people, advertise in **FINANCE.**

Single copies, ten cents.

Subscription price, $1.00 per year.

Advertising rates made known on application.

**St. Louis Finance Publishing Co.**
ST. LOUIS, MO., U. S. A.

# BOUND VOLUMES

**Vol. XIV. July-December, 1899,**
**Vol. XV. January-June, 1900,**

OF THE

*Telephone Magazine*

Substantially bound in Muslin, with Gilt Title, will be sent, postpaid, for $1.50 per volume to any address.

**Electrical Engineering Publishing Co.**
Marquette Building, CHICAGO.

## Only a Few of 'Em Left!

A SERIES OF SPECIAL TELEPHONE ARTICLES — along the practical lines of electrical and mechanical construction of apparatus, the modern theories of telephone practice, the ways of overcoming difficulties in exchange and line operation, and a general and complete resume of the status of the art — is soon to be begun in the

## ELECTRICAL REVIEW.

It is the purpose to largely increase the list of telephone readers during the next year. THE ELECTRICAL REVIEW pre-eminently covers the telephone field.

13-21 Park Row, New York.

## ADVERTISE YOUR

# WANTS

IN OUR

# WANT COLUMNS.




Digitized by Google

# BOOKS WE RECOMMEND

**Allsop, F. C.** Telephones, Their Construction and Fitting. A Practical Treatise on the fitting-up and maintenance of Telephones and the auxiliary apparatus. 208 illustrations, and folding plates. Third edition. 12mo, cloth ..... $1.25

**Bell, J., and Wilson, S.** Practical Telephony; adapted to Requirements of City and Guilds of London Institute. 8vo, limp cloth. London, 1898 ..... $1.00

**Bennett, A. R.** The Telephoning of Great Cities and an Electrical Parcel Exchange System. Two papers read before the British Association at Cardiff. Revised edition. Numerous diagrams. Paper..... $0.35

**Bennett, A. R.** The Telephone System of the Continent of Europe, with 169 illustrations. 8vo, cloth..... $4.50

**Bottone, S. R.** Electrical Instrument Making for Amateurs. A practical handbook, with 48 illustrations. Fourth edition. Enlarged by a chapter on The Telephone. 12mo, cloth ..... $0.50

**Dobbs, A. E.** Practical Features of Telephone Work. 134 pages. 5x7; 61 illustrations. Cloth. 1899..... $0.75
Chapter I. 1.—Pitfalls in Starting. Poor vs. Good Work. 2.—Starting the New Exchange; Wire; Aluminum Conductors. 3.—Country and Toll Lines. 4.—Exchange Lines and Circuits. 5.—Size of the Return Wire. 6.—Locating Lines, Poles, Insulators, etc.; Poles; Insulators. 7.—Guys, Braces, etc. 8.—Corner and Junction Poles, etc.; Guys; How to Cross-connect on Terminal Poles, etc.; Tree Trimming. 9.—Cables. 10.—Underground Conduits. 11.—Manholes; Counting Terminals; Fuses and Lightning Arresters. 12.—Selection of Instruments. 13.—Selection of Instruments. 15.—The Induction Coil, a Primary Lesson. 16.—The Receiver; Instrument Specifications; Wiring; Miscellaneous; Transmitters. 17.—Instrument and Line Troubles; other Items. 18.—Switchboards; Batteries; Central Battery Systems; Repeating Coils; Cross-connecting Boards. 19.—Hints on Exchange Management. Appendix—Wire Tables and Formulae; Specific Induction Capacities; Properties of Copper Wire; Properties of Galvanized and Steel Wire; Aluminum Wire; Supporting Capacity of Galvanized Strands; Spans, in Feet.

**Du Moncel, Count.** The Telephone, the Microphone and the Phonograph. With additions and corrections by Author. 70 illustrations. 12mo, cloth..... $1.25

**Herbert's** Telephone System of British Postoffice .. $1.50

**Hopkins, W. J.** Telephone Lines and Their Properties. New edition, revised and enlarged. Illustrated. 12mo, cloth..... $1.50

**Hopkins, William J.** The Telephone; Outlines of the Development of Transmitters and Receivers. 12mo, cloth. New York, 1898..... $1.00

**Houston, E. J., and Kennelly, A. E.** Electric Telephony. (Elementary Electro-Technical Series.) 16mo, cloth. Illustrated ..... $1.00

**Hughes, Norman.** The Magneto Hand Telephone. Its Construction, Fitting Up, and Adaptability to Every Day Use. 12mo, cloth..... $1.00

**Hyde, W. H., and McManman, J. A.** Telephone Inspector's Handbook. Telephone Troubles and How to Find Them. 64 pages. Many illustrations. Price $0.25
The only book enabling telephone men to instantly overcome telephone troubles.

**Miller, Kempster B.** American Telephone Practice. 518 large octavo pages. 379 illustrations .....$3.00
This book treats of the subject in a simple and comprehensive manner from the practical standpoint, and almost entirely without the use of mathematics. All matters of principle and practice are clearly and fully considered, enabling the reader to obtain an understanding, not only of the rudiments of telephony, but also of the most intricate circuits of modern exchanges. The text is profusely illustrated by cuts of commercial apparatus and carefully prepared diagrams of circuits. No diagram is given without a full explanation. The apparatus, circuits and methods of the American Bell Telephone Company are fully described, and a large amount of space given to the products of the various independent companies, the systems of nearly all of the more prominent companies being fully explained. Much space is devoted to overhead and underground construction work, the methods of erecting poles, stringing wires and cables, the laying of conduits and drawing in of cables being fully covered in detail. The final chapter gives a concise description of the apparatus and methods used in making all of the tests required in commercial telephone work, such as the measurement of resistance, insulation and capacity, and the location of faults on lines and cables.

**Patented Telephony.** 102 pages. Illustrated. Price, $1.50
A review of patents pertaining to telephones and telephonic apparatus, describing fully the more important details.

**Poole, J.** The Practical Telephone Hand-Book and Guide to the Telephonic Exchange. Second edition, revised and enlarged. 12mo, cloth, with 288 illustrations.....$1.50

**Preece, W. H., and Stubbs, Arthur T.** A Manual of Telephony. With illustrations and plates. 12mo, cloth, $4.50

**Prescott, G. B.** The Electric Telephone. Second edition, revised and enlarged. 795 pages. 8vo, cloth .....$6.00

**Thompson, Silvanus P.** Phillip Reis; inventor of the Telephone; a Biographical Sketch with Documentary Testimony. Translations of the Original Papers of the Inventor and Contemporary Publications. 8vo, cloth, 3 plates and 48 engravings.....$3.00

**Webb, H. L.** Telephone Hand-Book. 12mo, cloth. 133 illustrations. Chicago, 1900.....$1.00

## INDUCTION AND INDUCTION COILS.

**Allsop, F. C.** Induction Coils and Coil-Making. A Treatise on the Construction and Working of Shock, Medical and Spark Coils. With 118 illustrations. 12mo, cloth ...$1.25

**Bonney, G. E.** Induction Coils. A practical Manual for Amateur Coil-Makers. 101 illustrations. 12mo, cloth, $1.00

**Page, C. G.** History of Induction; the American Claim to the Induction Coil and Its Electro-Static Developments. In 3 parts. 8vo, paper. Washington, 1867. Rare ..$10.00

We will send any Electrical Book published upon receipt of cash, POST PREPAID.

*All orders must be accompanied by cash.*

# Electrical Engineering Publishing Co.

MARQUETTE BUILDING, CHICAGO, U. S. A.

Please mention TELEPHONE MAGAZINE in writing to advertisers.


Digitized by Google

# Wireless Telephony

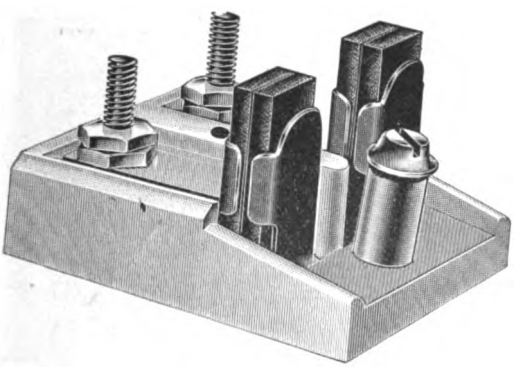
**A plain description of all the experiments up to date, together with diagrams and directions how to perform experiments with this great discovery. A full history, lacking in technicalities, but abounding with information on the subject of Wireless Telephony. Fully Illustrated. Cloth Binding.**

**Price, $1.00.**

## Electrical Engineering Publishing Co.

MARQUETTE BUILDING, CHICAGO, U. S. A.

---

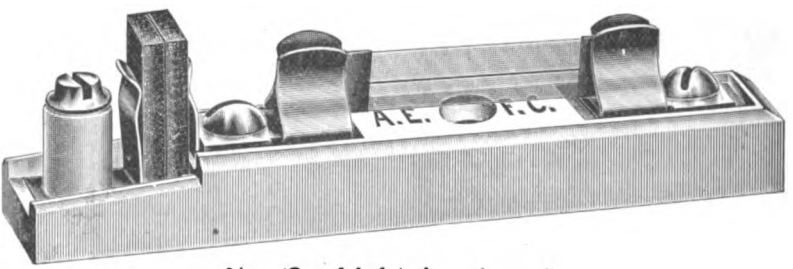


No. 23. Bobtail Lightning Arrester.

# 2

of the 100 specialties we manufacture. Get our catalogue and prices.

FUSE WIRE.
FUSE BLOCKS.
MAGNET WIRE JOINTS.
LIGHTNING ARRESTERS.




No. 42. Lightning Arrester.

## AMERICAN ELECTRIC FUSE COMPANY

NEW YORK
116 NASSAU STREET

**2 BIG STORES**

CHICAGO
345-347 S. CANAL ST.

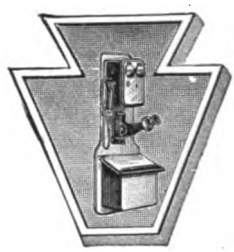
Please mention TELEPHONE MAGAZINE in writing to advertisers.


Digitized by Google

# Keystone Electric Telephone Co.

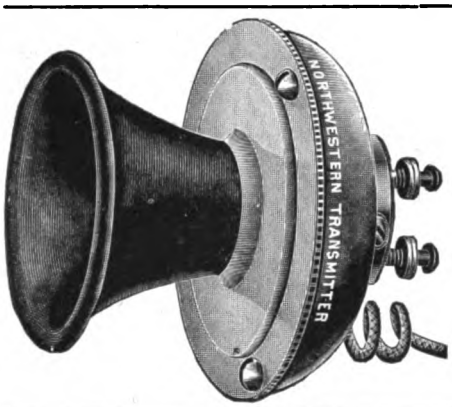
MANUFACTURERS OF HIGH-GRADE

## TELEPHONES AND SWITCHBOARDS



TOLL-LINE EQUIPMENT. || EXCHANGES EQUIPPED IN EVERY DETAIL.

WRITE FOR PRICES. Office and Factory, 565 Old Ave., PITTSBURG, PA.




## NORTHWESTERN TELEPHONE MANUFACTURING CO.

*We make Telephones for the Wholesale and Supply Trade.*

ANY STYLE, AND PARTS FOR ALL TELEPHONES.
WORKMANSHIP GUARANTEED.
SEND FOR PRICES.

Address 191 to 193 S. Canal St., CHICAGO.

THE ONLY

reasons that the most prominent telephone companies in the United States are using our telephones are—That they are better made, last longer, COST LESS FOR MAINTENANCE, show higher efficiency, make better appearance, please your subscribers better, and make collections easier than any other kind.

SWEDISH-AMERICAN TELEPHONE COMPANY
69-71-73-75 West Jackson Boulevard
CHICAGO, ILLINOIS, - - U. S. A.

## A Wonderful Invention.

They cure dandruff, hair falling, headache, etc., yet cost the same as an ordinary comb. What's that? Why

# Dr. White's Electric Comb.

The only patented comb in the world. People everywhere it has been introduced are wild with delight. You simply comb your hair each day, and the comb does the rest. This wonderful comb is simply unbreakable, and is made so that it is absolutely impossible to break or cut the hair. Sold on a written guarantee to give perfect satisfaction in every respect. Send stamps for one.

| | |
|---|---|
| Ladies' Size - | 50 cents |
| Gents' Size - - | 35 cents |

Live men and women wanted everywhere to introduce this article. Sells on sight. Agents are wild with success. (See want column of this paper.)

ADDRESS
D. N. ROSE, Gen. Mgr., Decatur, Ill.

## Do You Use Storage Batteries?

We Make All Kinds
Have Been for Eight Years

High-Tension Sets for Telephone Work a Specialty

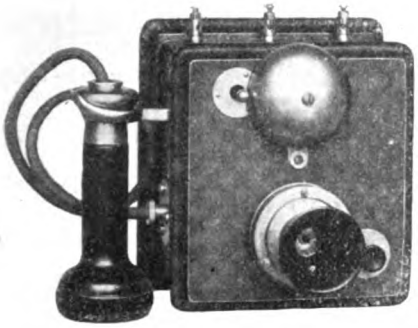
NO JARS PRACTICALLY DRY

PUMPELLY STORAGE BATTERY WKS.
329 Dearborn St., Chicago, U. S. A.




Digitized by Google

## METROPOLITAN BATTERY CALL TELEPHONE.



Operating underpatents, Jan. 4, 1896, Aug. 25, 1896, Feb. 4, 1896, Dec 8, 1896

A first-class telephone for house, office, factory, hotel and private line use at a low cost. Every part made electrically and mechanically perfect, and to withstand wearing and jarring; only three outside connections. These connections are made with a patented lock-nut fastening, binding post, exclusively our own; no chance for injury.

**PRICE, EACH, $2.50.** Dry Batteries, 20c each.

The signaling bell is adjustable. Calling key on top of box. Transmitter, latest improved. All connections soldered. Stock sizes finished in oak We can furnish any finish wood desired.

**OFFER** Two telephones, packed and shipped, complete with four batteries, on receipt of **$4.80.** Money refunded if telephones are not as represented. Once you see these telephones you will never buy any other.

**Metropolitan Electrical Supply Co.**
112-114 LAKE STREET, CHICAGO.

## *DUQUESNE GALVANIZING CO.*

Manufacturers and Shippers of

**Pole Line Construction Material.**

*SELF-COLORED, JAPANNED AND GALVANIZED CROSS-ARM BRACES.*

**Electro-Galvanized Cross-Arm Braces *a specialty***

WRITE FOR PRICES TO

McCANCE BROTHERS COMPANY,
*General Sales Agents,*
McCANCE BLOCK, PITTSBURG, PA.

## EUGENE FIELD'S POEMS. A $7.00 BOOK

THE Book of the century Handsomely Illustrated by thirty-two of the World's Greatest Artists.

## GIVEN FREE

to each person interested in subscribing to the Eugene Field Monument Souvenir Fund. Subscribe any amount desired. Subscriptions as low as $1.00 will entitle donor to this daintily artistic volume

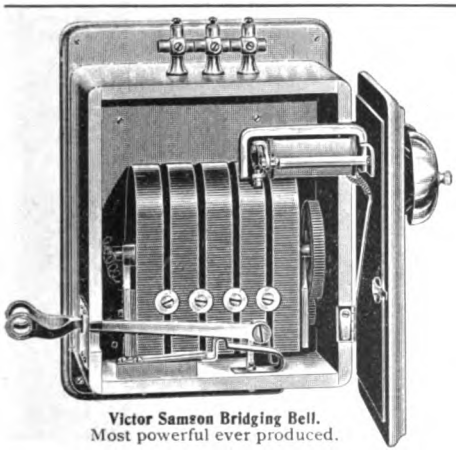
**"FIELD FLOWERS"**

(cloth bound, 8 x 11), as a certificate of subscription to Fund. Book contains a selection of Field's best and most representative works and is ready for delivery.

But for the noble contribution of the world's greatest artists this book could not have been manufactured for less than $7.00.

The Fund created is divided equally between the family of the late Eugene Field and the Fund for the building of a monument to the memory of the beloved poet of childhood. Address

**EUGENE FIELD MONUMENT SOUVENIR FUND,**
(Also at Book Stores) 180 Monroe St., CHICAGO.
If you also wish to send postage, enclose 10 cts.



Victor Samson Bridging Bell.
Most powerful ever produced.

THE

## Victor Telephone Works

203-207 So. Canal St., CHICAGO, ILL., U. S. A.

**EVERYTHING IN TELEPHONES AND SWITCHBOARDS**

***Thoroughly Practical, Nothing Experimental, and No Guesswork.***

Get our prices before placing your order. We guarantee our apparatus to be electrically correct and mechanically perfect.

A POPULAR SCIENTIFIC WEEKLY JOURNAL

# ELECTRICITY AND ELECTRICAL ENGINEERING

**The Most Successful Medium for Advertising in the United Kingdom**

WRITE FOR SAMPLE COPY AND ADVERTISING RATES

2 EXETER ST. STRAND LONDON, ENGLAND

ELECTRICAL ENGINEERING PUBLISHING CO., Marquette Building, Chicago, Ill.

**Please mention TELEPHONE MAGAZINE in writing to advertisers.**


Digitized by Google

ANTI-TRUST. **INDEPENDENTS** ANTI-MONOPOLY.

Keep the standardizing of your apparatus in your own hands, and do not depend upon the dictates of a manufacturers' combination.

# SWITCHBOARDS

FOR

## Metallic, Common Return, or Grounded Systems

Made in Sections of 100 lines each for any size Exchange.

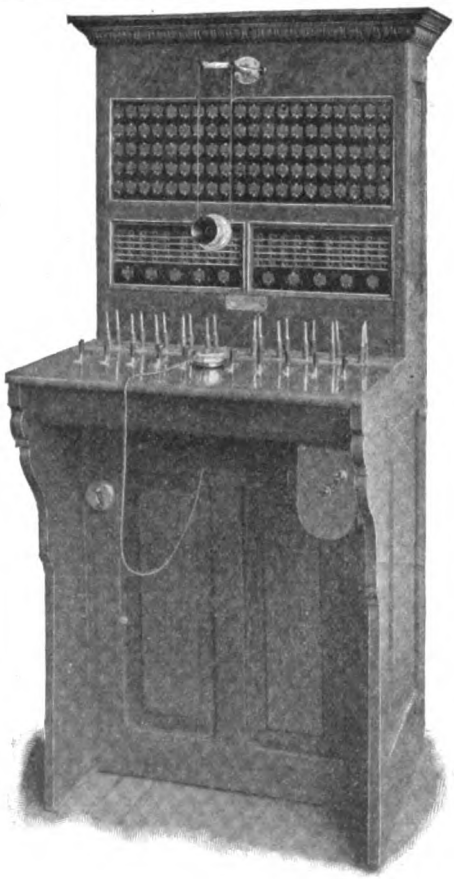
*SAME GRADE AS S. C. MULTIPLE BOARDS*

CONVENIENT, DURABLE AND RELIABLE.

ALL CONTACTS PLATINUM.

TELEPHONES REGULAR EXCHANGE (Automatic Shunt) TOLL-LINE (with extra heavy Generator)

IT HAS NO EQUAL



IT IS GUARANTEED INDEFINITELY

MULTIPLE SWITCHBOARDS FOR ANY SIZE EXCHANGE....

100 LINE S. C. TRUNKING SWITCHBOARD.

The Stromberg-Carlson Telephone Mfg. Co.

70-82 W. Jackson Boulevard, CHICAGO, ILL., U. S. A.

WE STAND STRICTLY INDEPENDENT

AND SOLICIT THOROUGH INVESTIGATION.



Digitized by Google

ANTI-TRUST. **INDEPENDENTS** ANTI-MONOPOLY.

Keep the standardizing of your apparatus in your own hands, and do not depend upon the dictates of a manufacturers' combination.

CENTRAL ENERGY SYSTEM.

DIVIDED CIRCUIT TOLL-LINE SYSTEM.

# TELEPHONES

THAT STAND unequaled and never fall down. Used throughout the United States, its Territories, COLONIES and Foreign Countries.

STRICTLY LONG-DISTANCE.

LASTS A LIFETIME.

SHIPMENTS MADE ON RECEIPT OF ORDER IF REQUIRED.

CORRESPONDENCE SOLICITED.

The Stromberg-Carlson Telephone Mfg. Co.

70-82 W. Jackson Boulevard, CHICAGO, U. S. A.

WE STAND STRICTLY INDEPENDENT

AND SOLICIT THOROUGH INVESTIGATION.

Please mention TELEPHONE MAGAZINE in writing to advertisers.

Digitized by Google

# Okonite Wires,

# Cables and Conductors

ARE THE STANDARD OF
EXCELLENCE IN

## TELEPHONE CONSTRUCTION.

**We carry a complete stock and make shipments the day orders are received.**

WE ARE SALES AGENTS FOR THE

## "National" Paper-Insulated Lead-Covered Cables.

IMMEDIATE SHIPMENTS OF ALL STANDARD SIZES
FROM FACTORY AT ATTRACTIVE PRICES.

## CENTRAL ELECTRIC CO.

264-266-268-270 Fifth Avenue, CHICAGO.

Please mention TELEPHONE MAGAZINE in writing to advertisers.


Digitized by Google

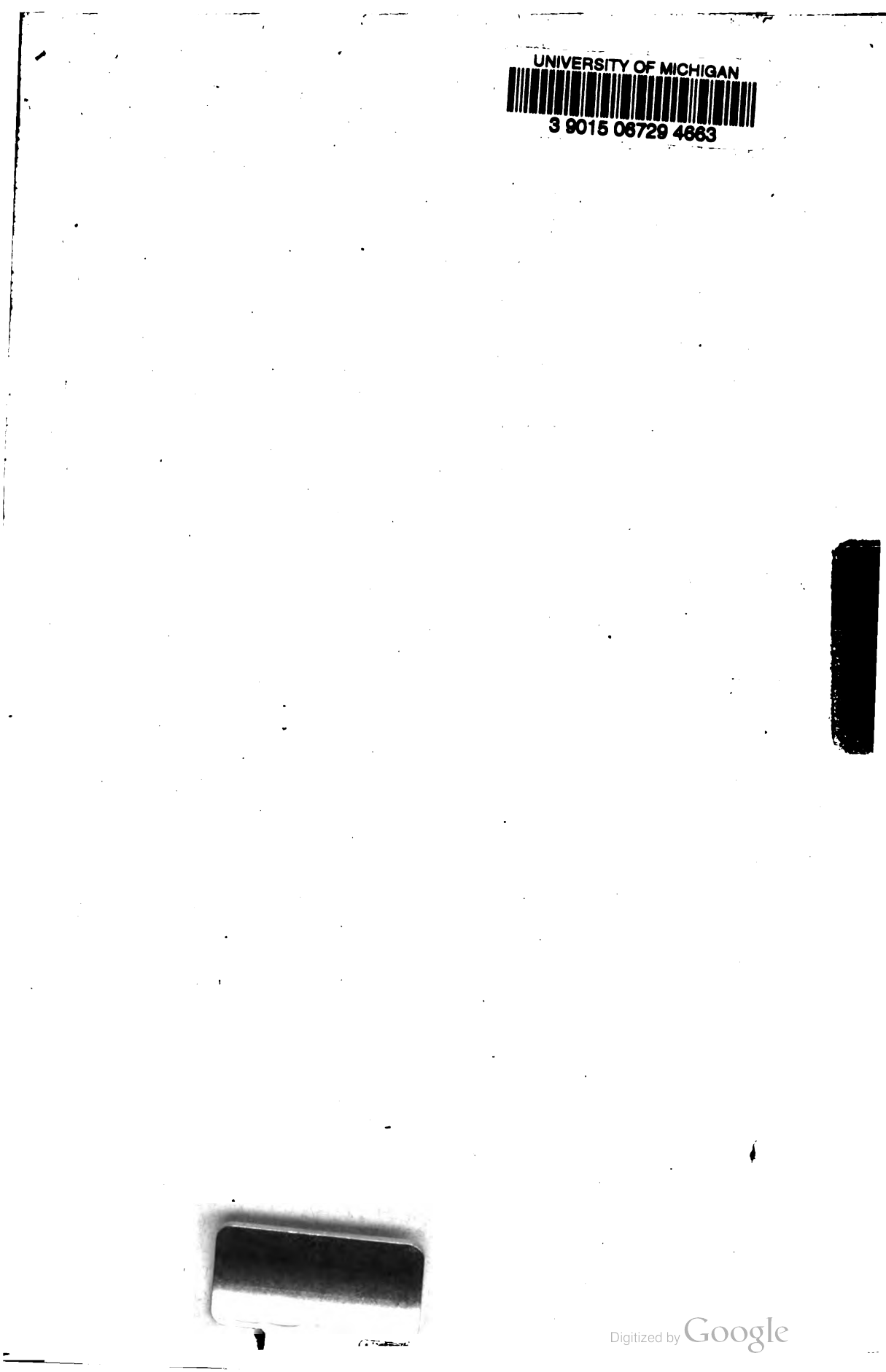
Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

UNIVERSITY OF MICHIGAN
3 9015 06729 4663



Digitized by Google

Digitized by Google